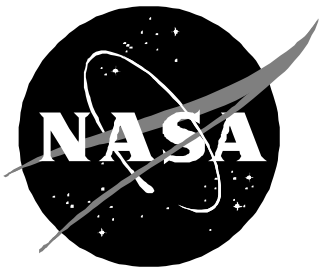

National Aeronautics
and Space Administration

February 1, 1999
AO 99-OSS-XX

DRAFT

Announcement of Opportunity

Gamma Ray Large Area Space Telescope (GLAST)

Flight Investigations

DRAFT Version 1.3

Comments Due: March 1, 1999

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APPENDICES

NOTE FOR DRAFT AO

It is NASA's goal to obtain the most exciting and compelling science investigations possible with the GLAST mission. The goal of this AO will be to solicit those science investigations. In order to improve the evaluation and selection of science investigations proposed for the GLAST mission and to enable the broadest possible participation in the GLAST mission, we are asking for comments on this draft AO which will help us meet those goals. The final version of this AO, when it is released, will certainly include numerous changes and improvements. It is important that all potential proposers be aware of the likelihood of change.

All comments on this draft AO should be directed to Dr. Alan Bunner, the Science Program Director for the Structure and Evolution of the Universe science theme in the NASA Office of Space Science, at the address below. Inquiries must be in writing and may be sent by mail, fax, or E-mail (the character string "GLAST AO" (without quotes) should be included in the subject line of all E-mail transmissions).

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Deadline for comments is March 1, 1999.

1.0 DESCRIPTION OF THE OPPORTUNITY

1.1 Overall Description

The National Aeronautics and Space Administration (NASA) is planning a new space mission, called the Gamma Ray Large Area Space Telescope (GLAST), for observing high energy gamma-rays from celestial gamma-ray sources. A high energy gamma-ray mission is identified in the Strategic Plan of the NASA Office of Space Science and is one of the highest recommendations of the Gamma Ray Program Working Group, the Structure and Evolution of the Universe Subcommittee, and the Space Science Advisory Committee.

The GLAST mission is planned as part of NASA's overall program in Space Science. The GLAST mission is scheduled for an Independent Assessment in 2000 and a Non-Advocate Review in 2001. It is anticipated that this will result in new start authority in Fiscal Year 2002. GLAST is planned for launch on an expendable launch vehicle in 2005 and is expected to have a facility lifetime of 5 years with the possibility of an additional 5 year extended mission.

This Announcement of Opportunity (AO) from NASA is for science investigations using GLAST. Investigations for which the development of flight instrumentation is proposed (Instrument Principal Investigator proposals) as well as those for which it is not (Interdisciplinary Scientist proposals) are solicited. This solicitation is open to all categories of organizations, domestic and foreign, including educational organizations, industrial organizations, nonprofit organizations, NASA Centers, and other Government agencies.

GLAST will identify and study nature's high-energy particle accelerators through observations of active galactic nuclei, pulsars, stellar-mass black holes, supernova remnants, gamma-ray bursts, and diffuse galactic and extragalactic high-energy radiation in the energy range from 20 MeV to 100 GeV and higher. GLAST will use these sources to probe important physical parameters of the Galaxy and the Universe that are not readily measured with other observations. The high-energy gamma-rays will be used to search for a variety of fundamentally new phenomena, such as particle dark matter and evaporating black holes.

The GLAST mission's scientific objectives require an instrument with large collecting area, imaging capability over a wide field of view, the ability to measure the energy of gamma-rays over a broad energy range, and time resolution sufficient to study transient phenomena. The instrument must also achieve sufficient background discrimination against the large fluxes of cosmic-rays, earth albedo gamma-rays, and trapped radiation that are encountered in orbit.

GLAST will be a Facility Class astronomical observatory, and research opportunities using GLAST will be available to the scientific community through future solicitations.

1.2 NASA Resources Available for GLAST Flight Investigations

GLAST is cost constrained, and cost will be an important criterion in the selection of scientific investigations and flight instrumentation. NASA currently has budgeted a maximum of $71.8M through FY 2005 for the formulation (Phase A/B) and implementation (Phase C/D) activities, through delivery, launch, and orbital verification, of all investigations selected under this AO. NASA currently has budgeted a maximum of $12.9M for mission operations and data analysis (Phase E) activities, allocated over the 5 year lifetime of the GLAST mission, for all investigations selected under this AO. Funds are planned to be allocated as follows:

Fiscal Year	2000	2001	2002	2003	2004	2005
Dollars (M)	3.7	4.1	16.9	20.7	20.2	6.2

Fiscal Year	2006	2007	2008	2009	2010
Dollars (M)	2.7	2.6	2.6	2.5	2.5

All budget numbers are given in real year dollars (RY$). This funding is contingent upon NASA receiving the requested appropriations and upon NASA receiving appropriate proposals in response to this AO. *[Note for Draft: All funding numbers are estimates and are expected to change. In particular, the effects of implementing full cost accounting for NASA civil servants has not been included in these funding numbers.]*

GLAST is not an approved program. GLAST is currently in Phase A (Concept Study) and is in the NASA strategic plan for a new start in Fiscal Year 2002. Therefore, this AO does not constitute an obligation on the part of the government to carry to completion efforts selected in response to this AO.

1.3 Specific Provisions

This AO solicits proposals for scientific investigations requiring GLAST. Instrument Principal Investigator (IPI) proposals involve investigations in which development of flight instrumentation is included as part of the proposed scientific investigation. Interdisciplinary Scientist (IDS) proposals involve investigations for which no flight instrumentation is proposed for development.

GLAST will contain a Large Area Telescope that will be capable of fulfilling the science objectives listed in the *GLAST Science Requirements Document* (see Appendix C). This AO solicits proposals for scientific investigations in which development of a Large Area Telescope is included as part of the proposed scientific investigation. An important criterion in the selection of this telescope will be the ability of the proposed design to meet the primary instrument measurement requirements given in the *GLAST Science Requirements Document* and in Section 4.2.1. NASA intends to select a single Large Area Telescope for GLAST.

The GLAST Facility Science Team has suggested that a Gamma-ray Burst Monitor on the GLAST spacecraft would enhance the science return of the GLAST mission. Therefore, this AO solicits proposals for scientific investigations in which development of a Gamma-ray Burst Monitor is included as part of the proposed scientific investigation. An important criterion in the selection of this instrument will be the ability of the proposed design to meet the instrument measurement requirements for a burst monitor in the *GLAST Science Requirements Document* and in Section 4.2.2. NASA reserves the right not to select any Gamma-ray Burst Monitor for any reason, including programmatic, budgetary, and/or scientific.

There may also be secondary science instruments other than a Gamma-ray Burst Monitor that would enhance the science return of the GLAST mission. This AO solicits proposals in which development of a secondary science instrument is included as part of the proposed scientific investigation. An important criterion in the selection of such an instrument will be the capability of the proposed design to enhance the ability of GLAST to meet the science objectives in the *GLAST Science Requirements Document*. NASA reserves the right not to select any secondary science instrument for any reason, including programmatic, budgetary, and/or scientific.

Proposals for scientific investigations that do not involve the development of flight instrumentation are also solicited with this AO. Science investigations of this type should be possible with any Large Area Telescope meeting the primary instrument measurement requirements specified in the *GLAST Science Requirements Document*. An important criterion in the selection of these investigations will be their relevance to the science objectives discussed in the *GLAST Science Requirements Document*.

GLAST is also expected to involve a Guest Investigator program including a Key Project program. A NASA Research Announcement soliciting proposals for guest investigations using GLAST data will be issued at a later date, nominally within one year of the GLAST launch date.

Proposers are encouraged to seek supplemental funding or contributions from sources other than NASA. Contributions could come through collaborations with non-US scientists and their funding agencies, contributions from other government agencies, or donations from foundations, industry, or individuals and institutions in the private sector.

Proposals will be evaluated by a scientific peer panel and by a technical and programmatic review panel. Proposals will be examined to ensure that they conform to the requirements and constraints in Section 4, including the detailed funding schedules, and they will be evaluated for cost and technical credibility as described in Section 6. The winning proposal(s) will be selected for a formulation phase followed by confirmation for development for flight. A peer review panel may be used to assist NASA in the confirmation process.

1.4 Proposal Opportunity Schedule

The schedule of events associated with this Announcement of Opportunity is as follows. All dates beyond the deadline for non-domestic letters of endorsement are targets. *[Note for Draft: All dates beyond the deadline for comments on the draft AO are targets and subject to change.]*

Release draft AO	February 1, 1999
Comments on Draft AO due	March 1, 1999
Release AO	TBD (May-June 1999)
Preproposal Briefing (see Section 5.1)	TBD + 1 month
Notice of Intent to propose due (see Section 5.1)	TBD + 2 months
Proposal due by 4 p.m. (Eastern Time)	TBD + 3 months
Non-U.S. Letters of Endorsement Due	TBD + 4 months
Selection of Investigations	TBD + 6months
Award of Contracts	TBD + 8 months

2.0 ANNOUNCEMENT OBJECTIVES

2.1 Scientific Objectives of the Gamma Ray Large Area Space Telescope

High-energy gamma-ray astronomy is currently in a period of discovery and vigor unparalleled in its history. In particular, the Energetic Gamma Ray Experiment Telescope (EGRET) on the Compton Gamma Ray Observatory (CGRO) has moved the field from a few detections of a small number of sources to intricate studies of several classes of galactic and extragalactic objects. The EGRET discoveries of gamma-ray blazars, pulsars, high-energy gamma-ray bursts, and a large class of unidentified high-energy sources have provided a new view of the high-energy gamma-ray sky while raising fundamental new questions about the origin, evolution, and destiny of nature's highest energy sources of radiation.

High-energy gamma-rays probe the most energetic phenomena occurring in nature. These phenomena typically involve dynamical non-thermal processes and include interactions of high-energy particles (electrons, positrons, protons, pions, etc.) with matter, photons and magnetic fields; high-energy nuclear interactions; matter-antimatter annihilation and possibly other fundamental elementary particle interactions. High-energy gamma-rays are emitted over a wide range of angular scales from a diverse population of astrophysical sources. Stellar-mass objects, in particular neutron stars and black holes, the nuclei of active galaxies that likely contain super massive black holes, interstellar gas in the galaxy that interacts with high-energy cosmic rays, the diffuse extragalactic background, supernovae that may be sites of cosmic-ray acceleration, and gamma-ray bursts are all gamma-ray emitters. Even the Sun has been found to produce high-energy gamma-rays during active periods. Many of the sources of high energy gamma-rays exhibit transient phenomena, ranging from the sub-second timescales of the fastest gamma-ray bursts to AGN flares lasting days or more. Often these sources radiate the bulk of their power at gamma-ray energies.

The Gamma Ray Large Area Space Telescope (GLAST) mission is a high-energy gamma-ray observatory designed for making observations of celestial gamma-ray sources in the energy band extending from 20 MeV to 100 GeV. The science objectives of GLAST are presented in the *GLAST Science Requirements Document*. Some of the major areas of science to be addressed by GLAST include, but are not limited to, the following topics:

- Active Galactic Nuclei (AGN): Gamma-ray observations have yielded a great many results on individual sources, allowed the beginnings of class studies, and have become an integral part of the multiwavelength approach to studying blazars. Despite this, fundamental questions about the formation of AGN jets, particle acceleration, and broad-band radiation mechanisms remain. By studying gamma-ray emission from all known blazars (and possibly other AGN classes) and correlating these observations with those at other wavelengths, new understanding of the AGN phenomenon will result.

- Isotropic Background Radiation: The identification of a cosmic background would have profound implications on studies of the early Universe. Spatial and temporal studies of the isotropic emission and the search for anisotropies will couple nicely with AGN class studies to fully describe the diffuse radiation.

- Gamma Ray Bursts: By detecting high-energy radiation from approximately 100 bursts per year (as compared to ~1 per year for EGRET), GLAST will provide constraints on physical mechanisms for gamma-ray bursts and allow studies of the relationship between GeV emission and keV-MeV emission as a function of time. Measurements of intrinsic burst spectra at GeV energies can be used to constrain relativistic fireball models or provide measurements of cutoffs due to absorption on the extragalactic background light.

- Molecular Clouds, Supernova Remnants, and Normal Galaxies: Determining the sites and mechanisms of cosmic ray production is a fundamental problem in physics. GLAST gamma-ray mapping and energy spectral measurements will provide direct evidence of proton cosmic-ray acceleration in supernova remnants.

- Endpoints of Stellar Evolution ñ Neutron Stars and Black Holes: An order of magnitude increase in the number of detected gamma-ray pulsars will greatly enhance our understanding of the basic structure of pulsar magnetospheres and the sites and nature of particle acceleration. The ability to detect radio-quiet pulsars out to the galactic center will provide important new insights into the basic statistics of pulsar birthrates as well as a much better understanding of the pulsar contribution to the diffuse Galactic emission.

- Unidentified Gamma Ray Sources: Determining the type of object(s) and the mechanisms for gamma-ray emission from the unidentified gamma-ray sources is important. By measuring precise positions of these sources, the possible relationship between unidentified sources and supernova remnants, radio pulsars, molecular clouds, and other candidates can be explored. Perhaps an entirely new source population is involved.

- Dark Matter: Many models of cold dark matter feature heavy supersymmetric particles whose line emission can be detected in the 10's or 100's of GeV range. Another form of dark matter may be primordial black holes. While EGRET has already set important limits on primordial black hole production, greater sensitivity and the ability to identify and distinguish between photons arriving simultaneously in the instrument would aid in further primordial black hole studies.

2.2 Categories of Participation

This AO is a solicitation for proposals in the following categories:

2.2.1 Large Area Telescope

This AO invites proposals for scientific investigations for which a Large Area Telescope, capable of fulfilling the science objectives listed in the *GLAST Science Requirements Document*, is proposed to be developed. NASA intends to select a single Large Area Telescope for GLAST. The principal investigator of such a proposal, if selected, will be a GLAST instrument principal investigator (IPI). The IPI and three Co-Investigators, designated in the proposal, of the selected Large Area Telescope proposal will be members of the GLAST Science Working Group (SWG).

2.2.2 Gamma-ray Burst Monitor or other Secondary Instrument

This AO solicits proposals for scientific investigations for which a Gamma-ray Burst Monitor, or other secondary instrument, is proposed to be developed. The Principal Investigator of such a proposal, if selected, will be a GLAST IPI. NASA may, or may not, select a Gamma-ray Burst Monitor or other secondary instrument for GLAST. The IPI of any selected secondary instrument will be a member of the GLAST SWG.

2.2.3 Interdisciplinary Scientist(s)

This AO solicits proposals for scientific investigations that do not involve the development of flight instrumentation. The Principal Investigator of such a proposal, if selected, will be a GLAST Interdisciplinary Scientist (IDS). IDS's will, in addition to their scientific investigations, be members of the GLAST SWG. The SWG, including the IDS's, will assist the GLAST Project by maintaining a broad and critical scientific overview of the GLAST development. The SWG, including the IDS's, will advise the GLAST Project of new developments in related scientific fields that could have a potential impact on the objectives of GLAST. Proposers for IDS should possess a broad knowledge of gamma-ray astronomy, high energy physics, and the related scientific disciplines that can have a bearing on the scientific success of GLAST. IDS proposals may not propose development of flight instrumentation, nor may they include Co-Investigators. A proposer will not be selected for both IPI and IDS positions. A proposer for IDS may, however, appear as a Co-Investigator on an IPI proposal. NASA intends to select approximately four IDS's.

3.0 Background

3.1 Previous High Energy Gamma Ray Missions

The first high energy gamma-ray astronomy observations from space were obtained with an instrument on NASA's OSO III in 1967. The detector had an effective area of approximately 4†cm^2 and confirmed predictions that the Milky Way was a source of diffuse gamma-ray emission. The high energy gamma-ray detector on SAS-2, launched by NASA in 1972, had an effective area of about 100 cm^2 and very low instrumental background. Although the SAS-2 detector operated for only six months, it was the first to detect the isotropic, apparently extragalactic, background gamma-ray emission. It also detected the Crab and Vela pulsars and the then-unidentified Geminga pulsar. The high energy gamma-ray detector on COS-B, which was launched by ESA in 1975, had an effective area of about 50 cm^2 and much greater background than SAS-2, owing partly to an elliptical orbit that carried it into the radiation belts for much of its orbit. COS-B operated for seven years and COS-B observations yielded a catalog of 25 gamma-ray point sources, including 3C 273, the first known extragalactic high energy gamma-ray source.

The EGRET instrument on NASA's Compton Gamma Ray Observatory, launched in 1991 and still operating, has an effective area of approximately 1500 cm^2, good angular resolution, and a very low instrumental background. The most recent catalog of EGRET point sources has more than 250 entries, including five gamma-ray pulsars. EGRET observations have established blazars as a class of extragalactic gamma-ray emitters. The EGRET detection of the Large Magellanic Cloud established that cosmic rays may be Galactic in origin. EGRET has permitted detailed study of the diffuse emission from the Milky Way and resolved several interstellar cloud complexes. The majority of the EGRET sources remain unidentified, many of which are seen to be variable, occasionally flaring on time scales of less than one day. EGRET has also detected high energy gamma-ray emission from several gamma-ray bursts and from solar flares.

3.2 Programmatic Recommendations to NASA

The NASA Gamma Ray Astronomy Program Working Group (GRAPWG) considered the science priorities of NASA’s gamma-ray astronomy program following the ongoing Compton Gamma Ray Observatory and Rossi X-ray Timing Explorer missions and the upcoming ESA INTEGRAL mission. In *Recommended Priorities for NASA’s Gamma Ray Astronomy Program 1996-2010,* the highest priority recommendation of the GRAPWG is a next generation high energy gamma-ray mission such as GLAST.

In *The Evolving Universe: Structure and Evolution of the Universe Roadmap 2000-2020,* the NASA Structure and Evolution of the Universe Subcommittee (SEUS) laid out a science roadmap for NASA’s Structure and Evolution of the Universe science theme within the Office of Space Science. The first observatory class NASA mission recommended to meet the SEUS’s highest priority science objectives is a high energy gamma-ray facility that will observe relativistic jets and study the sources of cosmic gamma-ray bursts. The SEUS recommended GLAST as the next step in exploring the gamma-ray sky at GeV energies.

The NASA Office of Space Science's most recent strategic plan, *The Space Science Strategic Plan: Origin, Evolution, and Destiny of the Cosmos and Life*, presents the goals and objectives for NASA's space science program, as well as the missions and programs to address those goals. The Space Science Advisory Committee (SScAC) has recommended GLAST in the strategic plan as providing critical progress toward at least three of those goals.

4.0 REQUIREMENTS AND CONSTRAINTS

4.1 General Program Constraints and Guidelines

A proposal must establish the scientific merit of the investigation proposed. Since a proposal that is responsive to the stated objectives of this AO could ultimately entail the definition, design, development, and application of space flight and ground support equipment and instrumentation, it must adequately address the technical feasibility of the approach, the compatibility with the space craft interfaces, and the reasonableness of the efforts required within the proposed budget and schedule.

GLAST scientific instruments will be designed and developed within the framework of a tightly cost controlled program. The phases of science instrument definition, design, development, delivery, and acceptance testing must be completed according to the schedule in Section 4.7. It is imperative that a proposer establish and maintain a credible low cost approach and schedule throughout the development of flight-quality instruments and support hardware and software.

Instrument Principal Investigator proposals must designate a single Principal Investigator who may be from any category of domestic and non-domestic organizations, including educational institutions, industry, nonprofit institutions, NASA Centers, the Jet Propulsion Laboratory, and other Government agencies. The PI will be held fully responsible for implementation of the proposed efforts, including: the quality of the scientific investigation and the dissemination of results, all necessary developments; timely delivery of required documentation, software, and equipment within budget limitations; and final performance of the instrument. The PI must be supported by an appropriate team of personnel that may also include co-investigators. Each Co-Investigator identified in the proposal must have clearly defined responsibilities involving definition and conduct of the scientific investigations and/or development of the science instrument.

Teaming arrangements among universities, industry, nonprofit institutions, and/or Government agencies (both foreign and domestic) are encouraged for IPI proposals.

To ensure that the GLAST payload complement is compatible with all cost, schedule, and technical requirements, the investigations selected under this proposal will be implemented in two phases. The first phase will be for formulation only (Phase A/B). The second phase will be for implementation, flight operations, and data analysis (Phase C/D and Phase E). Progress from formulation to implementation is predicated on the successful completion of a NASA Non-Advocate Review (NAR). Based on the results of the NAR, the NASA Associate Administrator for Space Science will confirm the investigation as originally selected, direct modification to meet project schedule and funding limitations, or terminate the selected investigation. At that time, firm commitments to performance specification, costs, schedule, and scope will be established. Proposals submitted in response to this AO must cover the entire program, including the implementation and operations phases, and must be based upon the best available data.

Instrument Principal Investigator proposals submitted in response to this AO must address the science objectives for GLAST and show how the proposed scientific investigations will help meet those objectives. Proposals must exhibit technical feasibility within current technology or technology that can reasonably be expected to be developed under the proposed approach and within the proposed schedule and resources. IPI†proposals must include software as required to support instrument operations and data analysis, command list, health and safety monitoring, and data processed and calibrated to a level that is usable to the general community.

IPI proposals proposing development of a Large Area Telescope must include an instrument operation center. The instrument operation center will be responsible for nominal instrument operations before and during flight, instrument calibration before and during flight, instrument health and safety monitoring before and during flight, production and maintenance of software as required for all operations before and during flight, support of the mission operation center and guest observer facility before and during flight, revised operations for targets of opportunity during flight, production of standard data products and data analysis software that are useable to the general community, and verification of flight data.

NASA will later select a site, or sites, for mission operations, spacecraft operations, and science operations including a guest observer facility for science data processing to support the general science community. Tasks anticipated to be performed by the science operations facility are not solicited in this AO and should not be included in the proposal for an instrument operations center. Among the tasks planned for the science operations facility will be supporting peer reviews for the GLAST guest observer program, creating the observing time line and command uploads, production data processing, generation of high-level data analysis tools, providing data to guest observers for verification, providing general support to guest observers, and populating and maintaining the GLAST public data archive.

The GLAST spacecraft will be solicited by the GLAST Project Office. The spacecraft provider will be responsible for the development of the spacecraft bus, the system-level integration and test with the facility instrument, and the mission-level integration and test with the launch vehicle. A spacecraft accommodations study will be performed in FY00, following the awards from this AO. The accommodations study will determine the feasibility of using a catalogued spacecraft vendor from the GSFC Rapid Spacecraft Development Office (RSDO). If feasibility is determined, then a Request For Offer will be released in the third quarter of FY01 with a spacecraft contract awarded by the end of FY01. If a catalogued vendor from the RSDO does not satisfy the GLAST mission needs, then a procurement for a unique spacecraft design will be initiated with a Request for Proposal in the fourth quarter of FY00.

Interdisciplinary Scientist proposals submitted in response to this AO must address the science objectives for GLAST and show how the proposed scientific investigations will help meet those objectives with instrumentation having the performance characteristics specified in Section 4.2 of this AO.

All proposed science investigations should specify a discrete number of objects or sources for investigation that are consistent with the nominal mission profile requirements in Section 4.2. Proposals to reserve entire classes of objects or an entire field of research will not be selected. All instrument data must be available to the general public following a reasonable period for data calibration and verification.

Investigators may submit more than one proposal. However, a proposer will not be selected for both IPI and IDS positions.

4.2 Science Requirements

4.2.1 Large Area Telescope

The *GLAST Science Requirements Document* presents the science requirements for the GLAST Large Area Telescope. These requirements have been used to generate expected performance characteristics for the Large Area Telescope and are summarized in Table 1. Proposers are encouraged to propose tradeoffs between these characteristics in order to optimize scientific return and to trade the scientific return against instrument cost, mass, size, and power.

TABLE 1: Expected Performance of the Large Area Telescope

Quantity	Baseline	Goal
Energy Range	20 MeV – 300 GeV	10 MeV – >300 GeV
Energy Resolution [1]	10% @ E > 100 MeV	2% @ E > 10 GeV
Effective Area [2] @ E > 100 MeV	8000 cm^2	>10,000 cm^2
Single Photon Angular Resolution (68%; on-axis) [3]	< 3.5° @ E = 100 MeV < 0.15° @ E > 10 GeV	<2° @ E = 100 MeV
Single Photon Angular Resolution (95%; on-axis) [3]	$< 3 \times \theta_{68\%}$	$< 2 \times \theta_{68\%}$
Single Photon Angular Resolution (off-axis at FWHM of FOV)	< 1.7 times on-axis resolution	< 1.5 times on-axis resolution
Field of View [4]	2 sr	3 sr
Source Location Determination [5]	1 – 5 arcmin	30 arcsec – 5 arcmin
Point Source Sensitivity [6] @ E > 100 MeV	4×10^{-9} cm^{-2} s^{-1}	2×10^{-9} cm^{-2} s^{-1}
Time Resolution	10 μsec	2 μsec
Background Rejection	$> 10^5$:1	$> 10^6$:1
Dead Time	< 100 μs per event	< 20 μs per event and < 10% instrument average for event rates up to 10 kHz
Mission Life	5 years, with no more than 20% degradation	10 years

1 Equivalent Gaussian sigma, on-axis.

2 Peak effective area, including inefficiencies necessary to achieve required background rejection.

3 Space angle for 68% and 95% containment.

4 Integral of effective area over solid angle divided by peak effective area. The geometric factor is the Field of View times the Effective Area.

5 Range from bright sources to sources of 10^{-8} photons cm^{-2} s^{-1} flux at E >100 MeV.

6 Sensitivity at high latitudes after a 2 year survey.

4.2.2 Gamma-ray Burst Monitor

The *GLAST Science Requirements Document* presents the science requirements for a possible GLAST Gamma-ray Burst Monitor. These requirements have been used to generate the expected performance characteristics summarized in Table 2. Proposers are encouraged to propose tradeoffs between these characteristics in order to optimize scientific return and to trade the scientific return against instrument cost, mass, size, and power.

TABLE 2: Expected Performance of the Gamma-ray Burst Monitor [1]

Quantity	Baseline
Energy Range	50 ñ 300 keV
Field of View	2π sr
Sensitivity [2]	0.5 photons cm^{-2} s^{-1}

[1] Nominal mass and power resources are 50 kg and 50 W.

[2] Flux for a 5 second burst.

4.2.3 Nominal Mission Profile

The GLAST Facility Science Team has recommended a nominal mission profile for GLAST. Instrument Principal Investigator proposals and Interdisciplinary Scientist proposals should be consistent with this mission profile.

After a 30-60 day in-orbit checkout, GLAST will conduct twelve months of scanning observations. The scanning pattern will be selected to cover the entire sky in a manner that is scientifically optimized. The scanning observations of the first year may be interrupted by extraordinary Targets of Opportunity. Subsequent years of operation will be a combination of scanning and pointing observations as driven by competitive guest investigator proposals.

During the first year of operations following the in-orbit checkout, the Large Area Telescope (LAT) instrument team is responsible for calibration of the instrument and verification of the data. The LAT instrument team will conduct an all-sky survey during the first year of operations. They should develop a catalog of high energy gamma-ray sources and carry out other science investigations as proposed in the successful LAT proposal. All data from the first year of operations will be placed in the GLAST public data archive within 12 months after receipt of data. This period of time allows for instrument calibration and data verification.

During the first twelve months of science operations, data from specific sources of interest to individual researchers will be made available upon request; large projects are not considered "specific sources of interest." At all times, including the first twelve months of science operations, the data from transient sources discovered or detected by GLAST will immediately be made publicly available. During the first twelve months of operations, the instrument may not have been completely calibrated, and thus any data made available may be unvalidated and unverified.

Interdisciplinary Scientists should propose science investigations that can be carried out using data from the all-sky survey or data from the GLAST public data archive. No specific instrument pointings or other science operations are expected to be carried out to support IDS investigations.

After the first twelve months, GLAST science operations will be based on a Guest Observer program for which NASA intends to release periodic calls for proposals. Proposals will be competitively peer reviewed, and NASA intends to select investigations to comprise the GLAST Guest Observer program. It is anticipated that the Guest Observer program will be idea driven and that it will consist mostly of non-pointed observations. Data that is gathered for a peer-reviewed Guest Observer investigation will be verified by the guest observer. After a three month data verification period, the data will be placed in the GLAST public data archive. Data that is not gathered in response to a peer reviewed science investigation will be verified by the GLAST guest observer facility. After a two week data verification period, the data will be placed in the GLAST public data archive.

GLAST will conduct Key Projects defined as large science investigations that may involve new pointed or scanning observations, or that may involve large scale data mining of the GLAST public data archive. Key projects will be solicited and selected through competitive peer review. Key projects may be proposed for any part of the mission, including the first twelve months. However key projects for the first twelve months must be compatible with the LAT team's all-sky survey and other science investigations selected under this AO. Data from key projects will be verified by the key project investigation team; after a three month data verification period, it will be placed into the GLAST public data archive.

4.3 Education, Public Outreach, Technology, and Small Disadvantaged Business Requirements for Instrument Principal Investigator Proposals

Proposals for science investigations proposing the development of flight instruments will be evaluated for their education, public outreach, new technology, and small disadvantaged business activities.

4.3.1 Education and Outreach

The Office of Space Science (OSS) has developed a comprehensive approach for making education at all levels (with a particular emphasis on K-14 education), and the enhancement of public understanding of space science, integral parts of all of its missions and research programs. The two key documents that establish the basic policies and guide all OSS Education and Outreach activities are a strategic plan, entitled *Partners in Education: A Strategy for Integrating Education and Public Outreach Into NASA's Space Science Programs* (March 1995), and an implementation plan, entitled *Implementing the Office of Space Science (OSS) Education/Public Outreach Strategy* (October 1996). Both of these documents may be obtained either by selecting "Education and Public Outreach" from the menu on the OSS homepage at <http://spacescience.nasa.gov/>, or from Dr. Jeffrey Rosendhal, Code S, Office of Space Science, NASA Headquarters, Washington, DC 20546-0001.

In accord with these established OSS policies, all respondents to this AO whose investigations propose the development of flight instruments must include an Education/Public Outreach (E/PO) component as part of their overall proposal. In accord with the policies outlined in the education implementation plan referred to above, up to 2% of the total investigation budget over the period of performance of the proposal is anticipated to be allocated to education and outreach. OSS expects that a substantive education/outreach program will be an integral element of every selected investigation requiring the development of flight instruments, and that adequate resources will be devoted by proposers to the planning and implementation of such an effort. Proposed activities may also include public information programs that will inform the public through mass media or other means, or utilize other innovative ideas for bringing space science to the public. Proposals must include the IPI's approach for planning an education/outreach program, arranging for appropriate partners and alliances, implementing the education/outreach program (including appropriate evaluation activities), and planning for the dissemination of E/PO products and materials. Costs for such activities must be included as a part of mission planning, development, and operations costs.

The GLAST Project Office will also implement an E/PO plan for the GLAST mission. All investigators selected under this AO, IPI's and IDS's, are expected to support the GLAST E/PO activities as part of their SWG activities.

See Appendix E for a detailed discussion of evaluation criteria for E/PO proposals. Appendix E also provides information on the assistance available to develop E/PO proposals.

4.3.2 Advanced Technology

NASA seeks to infuse new technologies that enhance performance and reduce costs into its programs and to strengthen the mechanisms by which it transfers such technologies to the private sector, including the nonaerospace sector. The means by which NASA's Office of Space Science plans to implement new technology is described in the *Office of Space Science Integrated Technology Strategy* (April 1994), which can be accessed through the World Wide Web by selecting "Policies and Publications" from the menu on the OSS homepage at <http://spacescience.nasa.gov/>. GLAST presents an opportunity to develop and test new technologies and applications. Investigations dependent on new technology will not be penalized for risk provided that a credible plan including cost and schedule for implementing the new technology is shown, and adequate plans are described to provide a reasonable back-up approach that will assure the success of the investigation.

4.3.3 Small Disadvantaged Businesses and Minority Institutions

The Principal Investigator (PI) and team members shall agree to use their best efforts to assist NASA in achieving its goal for the participation of small disadvantaged businesses, women-owned small businesses, Historically Black Colleges and Universities, and other Minority Educational Institutions in NASA procurements. Investment in these organizations reflects NASA's commitment to increase the participation of minority concerns in the aerospace community, and is to be viewed as an investment in our future. Offerors, other than small business concerns and solitary investigators, are also advised that contracts resulting from this AO will be required to contain a subcontracting plan that includes goals for subcontracting with small, small disadvantaged, and women-owned small business concerns. (See Appendix A, Section XIII.)

4.4 Technical Approach Requirements for Instrument Principal Investigator Proposals

Proposals must encompass all technical aspects of the investigation from the initial studies through delivery of the data to the appropriate data repository and their analysis. NASA Program Guidelines NPA 7120.5 delineates activities, milestones, and products typically associated with each of these phases, and may be used as a reference in defining a team's mission approach. IPI teams have the freedom to use their own processes, procedures, and methods, and the use of innovative processes is encouraged when advantages in cost, schedule, technical improvements, and reliability can be demonstrated.

Each investigation shall have a cost-effective mission assurance program. This program should include a quality assurance program that is consistent with the ISO 9000 series, American National Standard, *Quality Systems ñ Model for Quality Assurance in Design, Development, Production, Installation. And Servicing, ANSI/ASQC Q9001-1994*.

The GLAST spacecraft procurement will follow the instrument definition effort. The GLAST Project Office at GSFC will manage the mission systems engineering effort to ensure that the instrument designs resulting from this AO are compatible with currently available spacecraft. In order to ensure that the GLAST instruments remain compatible with the GLAST spacecraft, all instruments must meet the generic interface requirements in the *GLAST Instrument to Spacecraft Interface Requirements Document* (see Appendix C). IPI proposals may propose deviations from this interface only if they specify sufficient funds in the IPI proposal within the funding guidelines of Section 5.6 to fund the development of a non-standard spacecraft interface.

4.5 Management Requirements for Instrument Principal Investigator Proposals

Investigation teams must be lead by a single Principal Investigator (PI) who may be from any category of U.S. or non-U.S. organization, including educational institutions; industry or non-profit institutions; or from one of the NASA Centers, the Jet Propulsion Laboratory, other Federally-funded research and development centers, or other U.S. Government agencies. Teams may be formed from personnel from any combination of these institutions.

NASA intends to give the PI and his/her team the ability to use their own management processes, procedures, and methods to the fullest extent possible. Investigation teams must define the management approach best suited for their particular teaming arrangement. This approach must be commensurate with the investigation's implementation approach, while retaining a simple and effective management structure that assures adequate control of development within the cost and schedule constraints. The investigation team must develop a Work Breakdown Structure that best fits its organizational approach and mission design concept.

The PI is expected to be the central person in charge of the investigation, with full responsibility for its scientific and technical integrity. The PI is responsible for assembling a team to propose and implement the investigation. Proposers may obtain services from any source. Note that the required level of management detail in the proposal is the same regardless of what organizations are part of the investigation team, even a NASA Center, other government laboratory, or Federally Funded Research Center. The PI is accountable to NASA for the scientific success of the investigation. Therefore, the PI must be prepared to recommend mission termination if, in his/her judgment, the successful achievement of established science objectives, as defined in the proposal, is no longer likely within the committed cost and schedule reserves.

Each investigation must define the risk management approach it intends to use to ensure successful achievement of the mission objectives within established resource and schedule constraints. Included in this discussion of risk management must be risk mitigation plans for any new technologies and the need for any long lead items that need to be placed on contract before the start of the development phase, to ensure timely delivery. In addition, manufacturing, test, or other facilities needed to ensure successful completion of the proposed investigation must be identified.

Each selected investigation must have a Project Manager (PM) who will oversee the technical implementation of the investigation. The role, qualifications, and experience of the PM must be adequate to ensure that the technical and managerial needs of the investigation will be met.

4.6 Cost Requirements

4.6.1 NASA Costs

The NASA funds available for instrument investigations proposing a Large Area Telescope, as well as instrument investigations proposing a Gamma-ray Burst Monitor or any other secondary instrument, are given below in real year dollars (RY$). NASA expects to select a single Large Area Telescope. Funds used for a Gamma-ray Burst Monitor or any other secondary instrument will reduce the funds available for the Large Area Telescope. Note that NASA reserves the right not to select a Gamma-ray Burst Monitor or any other secondary instrument.

	Fiscal Year	2000	2001	2002	2003	2004	2005
instruments	Dollars (M)	3.6	3.9	16.5	20.3	19.8	5.8

The NASA funds available during flight (Phase E) for the investigations proposing a Large Area Telescope, as well as any selected secondary instruments, to satisfy the requirements for an instrument operations center and to conduct science investigations are given here in RY$.

	Fiscal Year	2006	2007	2008	2009	2010
IOC & science	Dollars (M)	2.3	2.2	2.2	2.1	2.1

The NASA funds available for Interdisciplinary Scientist Investigations are given below in RY$. These are the average funds available for a single IDS, under the assumption that four IDS's are selected. NASA reserves the right to select more than four IDS's, but with proportionately smaller average funding levels.

	Fiscal Year	2000	2001	2002-2010
IDS (each)	Dollars (K)	25	50	100 / yr

All dollar amounts are in Real Year (RY) dollars. *[Note for Draft: All funding numbers are estimates and are expected to change. In particular, the effects of implementing full cost accounting for NASA civil servants has not been included in these funding numbers.]*

4.6.2 Full Cost Accounting

If NASA provided services are proposed to be used, NASA Civil Service labor and supporting NASA Center infrastructure must be costed on a full cost accounting basis. If NASA guidance for full cost accounting has not been fully developed by the closing date for proposal submission or for completion of the concept study, NASA Centers may submit full cost proposals based on the instructions in the *NASA Financial Management Manual*, Section 9091-5, Cost Principles for Reimbursable Agreements, or based on their own center-approved full cost accounting models. If any NASA costs are to be considered as contributed costs, the contributed item(s) must be separately funded by an effort complementary to the proposed investigation, and the funding sources must be identified. Other Federal Government elements of proposals must follow their agency cost accounting standards for full cost. If no standards are in effect, the proposers must then follow the Managerial Cost Accounting Standards for the Federal Government as recommended by the Federal Accounting Standards Advisory Board.

4.6.3 Goods and/or Services Offered on a No Exchange of Funds Basis

Contributions of any kind, whether cash or noncash (property and services), to GLAST investigations by organizations other than the Office of Space Science are welcome. Such contributions may be applied to any part or parts of an investigation. A letter of endorsement that contains a statement of financial commitment from each responsible organization offering to make a contribution to the investigation must be submitted with the proposals for all U.S. components. For non-U.S. components of proposals, see Section 4.8.

4.7 GLAST Development Schedule Requirements

GLAST is planned for a June 2005 launch. Proposed instrumentation must be fully integrated, environmentally tested, and ready for delivery to the GLAST spacecraft no later than September†1, 2004. A tentative schedule for the GLAST mission is as follows. Any proposed investigation proposing flight instrumentation should support this schedule. All dates beyond the due date for this AO are estimates and are subject to change. *[Note for Draft: All dates are targets and subject to change.]*

Concept Study (Phase A)	February 1, 1999 – March 31, 2000
System Requirements Review (SRR)	March 31, 2000
Formulation (Phase B)	April 1, 2000 – September 30, 2001
Independent Assessment	April 1, 2000 – August 31, 2000
Preliminary Design Review (PDR)	August 15, 2001
Non Advocate Review (NAR)	August 17, 2001
Implementation (Phase C/D)	October 1, 2001 – June 30, 2005
Critical Design Review (CDR)	July 31, 2002
Instrument Delivery	September 1, 2004
Launch	June 1, 2005
Flight Operations (Phase E)	July 1, 2005 – June 30, 2010

4.8 International Participation

Recognizing the potential scientific, technical, and financial benefits offered to all partners by international participation, participation by non-U.S. individuals and organizations as Principal Investigators, Co-Investigators, or team members in GLAST investigations is encouraged. Participation may include, but is not limited to, the contribution of instrument hardware, necessary facilities and services, and the subsequent sharing of the data from the mission, all on a no-exchange-of-funds basis.

The direct purchase of goods and/or services from non-U.S. sources is permitted. Proposers are advised that a contract or subcontract using funds derived from NASA by a U.S. team with a non-U.S. participant must meet NASA and Federal regulations. These regulations place an additional burden on investigation teams that must be explicitly included in discussions of the investigation's cost, schedule, and risk management. Information regarding regulations governing the procurement of non-U.S. goods or services is provided in Appendix F.

Participation by non-U.S. individuals and/or institutions as team members or contributors to GLAST investigations must be endorsed by the institutions and/or governments involved. If government support is required, then a government endorsement is also needed. The letter of endorsement must provide evidence that the non-U.S. institution and/or government officials are aware and supportive of the proposed investigation and will pursue funding for the investigation if selected by NASA. The endorsement must be submitted per the schedule in Section 1.4.

5.0 PROPOSAL SUBMISSION PROCEDURES

5.1 Preproposal Activities and Briefing

5.1.1 Bibliography of Relevant Reports and Applicable Documents

A bibliography of relevant reports and applicable documents contains references to additional requirements and background information for this Announcement of Opportunity. The GLAST Bibliography contains references to two documents whose requirements are incorporated into this AO by reference: the *GLAST Science Requirements Document* and the *GLAST Instrument to Spacecraft Interface Requirements Document*. Information on the GLAST Bibliography is contained in Appendix C.

5.1.2 Technical and Scientific Inquiries

Inquiries of a scientific or technical nature should be directed to Dr. TBD, the GLAST Program Scientist, at the address below. Inquiries are preferred in writing and may be sent by fax or E-mail (the character string "GLAST AO" (without quotes) should be included in the subject line of all E-mail transmissions).

Dr. TBD
GLAST Program Scientist
Research Program Management Division
Code SR
National Aeronautics and Space Administration
Washington, DC 20546-0001
Phone: 202-358-XXXX
Fax: 202-358-XXXX
E-mail: TBD@hq.nasa.gov

5.1.3 Preproposal Conference

A preproposal conference will be held at the NASA Goddard Space Flight Center, Greenbelt, Maryland, on the scheduled date given in Section 1.4, in the Building 8 Auditorium, beginning at 8:30 a.m. and concluding by 5:00 p.m. Further information, including logistics, can be accessed through the World Wide Web on the GLAST AO homepage at <http://glast.gsfc.nasa.gov/ao/> prior to the Preproposal Conference. The purpose of this conference will be to address questions about the proposal process for this AO, including a discussion of what NASA considers important in the evaluation of the nonscience criteria (see Section 6.2). Individuals planning to attend the preproposal conference are requested to notify Mr. Scott Lambros of the GLAST Project Office, NASA Goddard Space Flight Center, at:

Phone: 301-286-0118
Fax Number: 301-286-0232
E-mail: scott.lambros@gsfc.nasa.gov

Please give the number of persons attending, and if known, the names, addresses, and organizational affiliations of the attendees. The character string "GLAST PPC" (without quotes) should be included in the subject line of all transmissions. Participants must attend at their own expense and make their own travel arrangements.

The preproposal conference will address all those questions received by NASA no later than ten working days in advance of the conference. Questions should be addressed to Dr. TBD at the address above. Questions submitted after this date, including those provided in writing at the conference, will be addressed at the conference only as time permits. Anonymity of the authors of all questions will be honored. Answers to all questions submitted in writing, either prior to or at the preproposal conference, as well as copies of presentation materials, will be available through the World Wide Web on the GLAST AO homepage at <http://glast.gsfc.nasa.gov/ao/>. A GLAST AO preproposal conference video, including answers to all questions addressed at the conference, will be prepared and mailed approximately two weeks after the conference to all attendees who request one, to those submitting Notices of Intent to propose (see below), and to anyone who submits a request to Mr. Lambros via fax or electronic mail.

5.1.4 Notice of Intent to Propose

To assist NASA's planning of the proposal evaluation process, prospective proposers are requested to submit a Notice of Intent to Propose in accordance with the schedule in Section 1.4. Material in a Notice of Intent is for NASA planning purposes only, is confidential, and is not binding on the submitter. The Notice is to be submitted electronically by entering the requested information on the site at the World Wide Web address <http://props.oss.hq.nasa.gov/>. Proposers without access to the Web, or who experience difficulty in using this site, should contact Ms. Debra Tripp (E-mail: deb.tripp@hq.nasa.gov) for assistance.

To the extent the following information is known by the Notice due date, the Notice of Intent should include:

(a) Names, addresses, telephone numbers, E-mail addresses, and fax numbers of (1) the Principal Investigator; (2) any Co-Investigators; and (3) the lead representative from each organization (industrial, academic, educational, nonprofit, and/or Federal) expected to be included in the proposal team;

(b) Title of the proposed investigation, a brief statement of the scientific objectives of the investigation, and a brief description of the proposed instrument, if any; enough detail should be provided to allow the selection of competent reviewers.

(c) Identification of any new technologies that may be employed as part of the investigation; and

(d) A brief statement describing the education/public outreach objectives in the proposed investigation.

5.2 Format and Content of Proposals

General NASA guidance for proposals is given in Appendix A, which is considered binding unless specifically amended in this section of this AO. A uniform proposal format is required from all proposers to aid in proposal evaluation. The required proposal format and contents are summarized in Appendix B. Failure to follow this outline may result in reduced ratings during the evaluation process or, in extreme cases, could lead to rejection of the proposal without review.

5.3 Submission Information and certifications

5.3.1 Certification

A dated letter or cover page must be submitted with each proposal signed by an official of the sponsoring institution authorized to certify institutional support and sponsorship of the investigation, and of the management and financial parts of the proposal. Non-US proposals must be signed by an official of the sponsoring agency that certifies support and sponsorship of the proposed investigation. The proposal shall include a letter of endorsement signed by an institutional official from each organization expecting to provide critical, no-exchange-of-funds contributions of hardware, software, facilities, services, etc. This official must certify institutional support and sponsorship of the investigation, as well as concurrence in the management and financial parts of the proposal. Non-U.S. organizations must submit such endorsements to:

Ms. W. C. Barnes
Ref: GLAST AO 99-OSS-XX
Space Science and Aeronautics Division
Code IS
National Aeronautics and Space Administration
Washington, DC 20546-0001
Phone: 202-358-1664
Fax Number: 202-358-3029

with a copy to:

GLAST AO Support Office
Jorge Scientific Corporation
400 Virginia Avenue, SW, Suite 700
Washington, DC 20024
Fax Number: 202-554-2970

by the due date given in the schedule in Section 1.4. Additional certifications identified in Appendix G are required and must be included with the original, signed proposal.

5.3.2 Proposal Quantity

Proposers must provide 40 copies of their proposal, plus the signed original, on or before the proposal deadline given in Section 1.4. One copy of the entire proposal must be clear black on white paper of a quality suitable for reproduction.

5.3.3 Submittal Address

All proposals must be received at the following address by the schedule in Section 1.4:

GLAST AO Support Office
Jorge Scientific Corporation
400 Virginia Avenue, SW, Suite 700
Washington, DC 20024

Point of contact for commercial delivery:
Ms. Debra Tripp (phone: 202-554-2775).

Furthermore, one copy (over and above the 40 copies) of any proposal that includes any non-U.S. participants and/or institutional and governmental commitments must be sent to NASA Code IS at the address listed in Section 5.3.1.

5.3.4 Deadline

All proposals must be received at the address above by 4 p.m. Eastern Time on the closing date specified in Section 1.4. All proposals received after the deadline will be treated in accordance with NASA's provisions for late proposals (Appendix A, Section VII).

5.3.5 Notification of Receipt

NASA will notify the proposers in writing that their proposals have been received. Proposers not receiving this confirmation within two weeks after submittal of their proposals should inquire according to the contact information given in Section 5.1.2.

5.4 Specific Guidelines for Non-U.S. Proposers

Proposals from outside the United States must conform to the uniform proposal format specified in Appendix B. The proposal must be submitted according to the instructions in Section 5.3. In addition, one copy of the proposal and the letters of endorsement must be sent to the address in Section 5.3.1 according to the schedule in Section 1.4.

If review and endorsement are not possible before the announced closing date, sponsoring non-U.S. agencies may, in exceptional situations, forward a proposal without endorsement to NASA's Space Science and Aeronautics Division, Code IS, along with the date when a decision on endorsement can be expected. No proposal will be reviewed by NASA without endorsement from the appropriate government agency.

Proposers from non-U.S. institutions are not required to submit a Cost Proposal unless U.S. individuals seeking NASA support are involved in the proposal. A non-U.S. proposer must, however, submit a Management Proposal. If the proposal seeks NASA support, both Management and Cost Proposals must be signed by the U.S. individual and certified by the U.S. individual's institution in accordance with Section 5.3.1. Similarly, non-U.S. individuals who plan to participate as Co-Investigators on a U.S. proposal must have such participation endorsed by their appropriate government agency.

All proposals from non-U.S. institutions will undergo the same evaluation and selection process as those originating in the United States. For those non-U.S. proposals selected, NASA will arrange with the sponsoring agencies for participation on a cooperative, no exchange of funds basis, in which NASA and the sponsoring agencies will each bear the cost of discharging its separate responsibilities, including travel and subsistence for its own personnel.

6.0 PROPOSAL EVALUATION, SELECTION, AND IMPLEMENTATION

6.1 Evaluation and Selection Processes

All proposals submitted in response to this AO will be subjected to a preliminary screening to determine compliance to the constraints, requirements, and guidelines of this AO. Proposals not in compliance will be returned to the proposer without further review. IPI proposals in compliance with this AO after this preliminary assessment, but before the peer review described below, will be scrutinized for technical and fiscal integrity by NASA. The feasibility of the proposed approach for implementation will be evaluated. The intent of this evaluation will be, first, to assess the likelihood that any proposed hardware can be built and be delivered within the mission schedule for GLAST and, second, to independently estimate the likely cost-to-NASA for the investigation as proposed. The adequacy of the proposed instrument to comply with the constraints of GLAST, including compatibility with the spacecraft interfaces, will be evaluated by NASA during this preliminary review. In addition, the tentative plans for education, outreach, new technology, and small disadvantaged business activities will be evaluated by appropriate experts as part of this preliminary review.

Following these preliminary reviews, the merits of each proposal will be assessed against the criteria in Section 6.2 by a panel of scientific and technical peers of the proposers. The panel may be augmented through the solicitation of mail-in reviews as well, which the panels have the right to accept, in whole or in part, modify, or reject. A non-Government organization may be used by NASA to provide assistance in organizing and documenting the panel review process. The purpose of this peer evaluation is to determine the scientific and technical merit of each proposal expressed in terms of its inherent strengths and weaknesses. Results of the earlier feasibility and cost reviews by NASA will be available to these reviewers.

Proposers should be aware that during the evaluation and selection process, NASA may request clarification of a specific point or points in a proposal. Such a request and the proposer's response shall be in writing.

Once the panel evaluations are complete, an *ad hoc* Categorization Subcommittee of the Space Science Steering Committee (see below), composed wholly of Civil Servants, will convene to consider the peer review results. This Committee will categorize the proposals in accordance with procedures required by NFS Part 1872.403-1. These Categories are defined as follows:

> Category I. Well conceived and scientifically and technically sound investigation pertinent to the goals of the program and the AO's objectives and offered by a competent investigator from an institution capable of supplying the necessary support to ensure that any essential flight hardware or other support can be delivered on time and that data can be properly reduced, analyzed, interpreted, and published in a reasonable time. Investigations in Category I are recommended for acceptance and normally will be displaced only by other Category I investigations.
>
> Category II. Well conceived and scientifically or technically sound investigations which are recommended for acceptance, but at a lower priority than Category I.
>
> Category III. Scientifically or technically sound investigations which require further development.
>
> Category IV. Proposed investigations which are recommended for rejection for the particular opportunity under consideration, whatever the reason.

After the categorization of proposals, further discussions among representatives of the Office of Space Science at NASA Headquarters, the GLAST Project Office at Goddard Space Flight Center, and the proposers may occur for those proposals rated Category I and II to assess cost realism and development risk and to further clarify the existing proposal(s). Any such discussions will not be an opportunity to revise a submitted proposal. Note that if this option is exercised, all proposers in the Category I and II range will be contacted, and all those not in these Categories will be so notified and offered a debriefing.

The results of the evaluations and categorizations will be reviewed by the Space Science Steering Committee (SSSC), which is composed wholly of NASA Civil Servants and appointed by the Associate Administrator for Space Science. The SSSC will conduct an independent assessment of the evaluation and categorization processes regarding both their compliance to established policies and practices as well as their completeness, self-consistency, and adequacy of all materials related thereto. After this review, the final evaluation and categorization results will be forwarded to the Associate Administrator who will make the final selections in consultation with the Science Program Director for the Structure and Evolution of the Universe. The overriding consideration for the final selection submitted in response to this AO will be to maximize scientific return within the available budget.

It should also be noted that, in accordance with Section II of Appendix A, NASA reserves the right to select only a portion of a proposer's investigation and/or to invite his/her participation with other investigators in a joint investigation. In that case, all affected proposers will be given the opportunity to accept or decline such partial acceptance and/or participation with other investigators.

Following selection, direct responsibility for establishing a contract with the Principal Investigators of the GLAST Science Working Group will be assigned to the GLAST Project Office at the Goddard Space Flight Center. It is expected that funding for the definition studies for investigations proposing the provision of flight instruments will begin quickly thereafter.

Selected proposers will be notified immediately by phone and then by letter and provided with instructions for initiating their formulation (Phase A/B) study. Proposers not selected will be notified by letter and will be offered a debriefing. Such debriefings may be in person at NASA Headquarters or, if the investigation team prefers, by telephone. In the former case, NASA funds may not be used to defray travel costs by the proposer for a debriefing. In either case, along with the proposing Principal Investigator, a senior representative from key institution(s) of a proposal may also participate in such debriefings.

6.2 Evaluation Criteria

The fundamental aim of the NASA investigation acquisition process is the identification of scientific ideas that are tested and verified by unique instrumental and/or analytical capabilities that best suit the overall scientific and cost objectives of the GLAST program as described in this AO. Successful implementation of the GLAST Program requires, in addition to scientific merit, that the investigations be achievable within established boundary conditions of cost and schedule.

The evaluation criteria below will be used to evaluate and categorize proposals as described in Section 6.1. The evaluation factors, which are described more fully in subsections below, are listed in descending order of priority.

- The scientific merit of the proposed investigation;
- The technical merit of the proposed instrument (IPI proposals only);
- The feasibility of the proposed approach for implementation, including cost, cost risk, and schedule risk (IPI proposals only);
- The competence and experience of the investigator, investigation team, and sponsoring institution(s); and

The plan for education, outreach, new technology, and small disadvantaged business activities (IPI proposals only).

6.2.1 Scientific Merit of the Proposed Investigation

To evaluate the scientific merit, the goals and objectives of the proposed investigation will be assessed to determine the impact of the investigation on space science as a whole and, in particular, on the science objectives of the GLAST mission (see Section 2.1 and the *GLAST Science Requirements Document*). This evaluation will include the responsiveness and the relevance of the proposed investigation to the established GLAST mission objectives. A major element in the evaluation will be whether the data that are to be gathered will be sufficient to complete the proposed investigation. The long term value of the data base that any proposed instrument(s) will produce for enabling broad science investigations beyond those specifically proposed, with emphasis on investigations relevant to the stated science objectives of the NASA Office of Space Science and the of the GLAST mission, is an important element of this criterion.

6.2.2 Technical Merit of the Proposed Instrument

The technical merit of any proposed instrument will be evaluated for investigations requiring the provision of flight instrumentation. Each proposed investigation will be evaluated for its technical merit, feasibility, and the probability of success. Technical merit and feasibility will be evaluated by assessing the degree to which any proposed instrument(s) can be built using the proposed technologies and the degree to which the proposed instrument(s) can provide the necessary data for the proposed investigation, as well as the degree to which the GLAST mission will support the accomplishment of acquisition of the required data. Areas requiring critical technology development of the instrument for flight readiness will be identified. Should a new technology that represents an untested advance in the state of the art be proposed for use, an assessment will be made of the likelihood of the technology for incorporation into the proposed instrument and its readiness to support the GLAST development schedule. The adequacy of any proposed instrument(s) to comply with the overall physical and functional constraints of the GLAST observatory, and the compatibility of the proposed instrument(s) with the GLAST observatory hardware and with its functional interfaces will be evaluated as well. Other major elements for evaluation include the plans for the instrument operations center, the proposed data processing and analysis plan, and the timely delivery of the data to the GLAST science operations center.

6.2.3 Feasibility of the Proposed Approach for Implementation, including Cost, Cost Risk, and Schedule Risk

The technical and management approaches will be evaluated to assess the likelihood that the investigation can be implemented as proposed. This includes an assessment of the risk of meeting the project's schedule and of completing the investigation within the proposed cost. The current state of development of the proposed instrumentation hardware and design is a factor in the evaluation of feasibility and risk. The costs expected to bring the investigation to a satisfactory completion, a credible schedule that provides the instrumentation, software, and

documentation on a schedule compatible with GLAST requirements, the ability of the IPI to meet major project milestones and hardware delivery dates, and adherence to good management practices as exhibited in the management plan are all evaluation criteria. Mission resiliency (the flexibility to recover from problems), including margins, reserves, and descope options, will also be evaluated.

The evaluation will consider the proposer's understanding of the processes, products, and activities required to accomplish development of all elements (e.g., flight systems, ground and data systems, etc.) and integration and the adequacy of the proposed approach, as demonstrated in the proposal. The proposed technical approach will be examined in its entirety to ensure that (1) all elements and processes are addressed, (2) weaknesses and design issues are understood and plans for resolution have been identified, (3) fundamental design trades have been identified and studies planned, and (4) primary performance parameters have been identified and minimum thresholds established. The overall approach (including schedule), the specific design concepts, and the known hardware/software will be evaluated for soundness, achievability, and maturity. The experience and expertise of the development organizations will be important factors in assessing the probability of success. Innovative cost effective features, processes, or approaches will be rewarded if proven sound.

The information provided in the Management section must demonstrate the proposers' plans, processes, and organization for managing and controlling the development and operation of the mission and will be evaluated on the soundness and completeness of the approach and the probability that the management team can assure mission success. The soundness and completeness of the approach will be evaluated by reviewing the organizational structure (including roles, responsibilities, accountability, and decision making process) and the processes, plans, and strategies the team will use to manage the various mission elements. Factors in this evaluation will include: clear lines of authority, clean interfaces, prudent scheduling and cost control mechanisms, review processes, and demonstrated awareness of all necessary management processes. Factors in the evaluation of the probability of mission success will include the experience, expertise, and commitment of key personnel and the organizations to which they are attached, the adequacy of facilities and equipment proposed for the mission, the adequacy of the team's approach to risk management, and the adequacy of the management and control mechanism. Innovative management processes and plans will be rewarded if proven to be sound.

6.2.4 Competence and experience of the investigator, investigation team, and sponsoring institution(s)

The competence and relevant experience of the proposer and any proposed investigative team will be evaluated as an indication of their ability to carry the investigation to a successful conclusion, and the commitment of the proposer's institution, as measured by the willingness of the institution to provide the necessary support (logistics, facilities, etc.) to ensure that the investigation can be completed satisfactorily. IDS proposers will be evaluated on whether they have demonstrated a broad knowledge of gamma-ray astronomy, high energy physics, and the related scientific disciplines that can have a bearing on the scientific success of GLAST.

6.2.5 Education, Outreach, New Technology, and Small Disadvantaged Business Activities

The tentative plans for education, outreach, new technology, and small disadvantaged business plans described in the proposal will be rated by evaluating their credibility and the degree to which they propose to meet the program requirements in each of these areas as described in Section 4.3. Specific evaluation criteria for education and public outreach are given in Appendix†E.

6.3 Selection Factors

As described in Section 6.1, the results of the proposal evaluations based on the criteria above and categorizations will be considered in the selection process. The overriding consideration for the final selection of proposals submitted in response to this AO will be to maximize scientific return within the available budget.

Proposers to this AO should recognize that the program of the Office of Space Science is an evolving activity that critically depends upon Administration policies and budgets, as well as Space Science objectives and priorities, any of which may change quickly. Therefore, the Associate Administrator of the Office of Space Science will use all relevant science planning, policy, and cost considerations when making selection(s) among top ranked proposals submitted in response to this AO.

6.4 Implementation Procedures

6.4.1 Notification of Selection

Following selection, appropriate letters of selection or rejection will be sent to all proposers. All proposers will be offered a debriefing concerning the strengths and weaknesses of their proposals as described in Section 6.1.

6.4.2 Award Administration and Funding

All selected proposers will be contacted immediately in order to establish a funding mechanism as quickly as possible. In particular, it is expected that all selected members of the GLAST SWG will attend a first meeting of the SWG within approximately four weeks of selection notification.

Should a non-U.S. proposal be selected, NASA's Office of External relations, Space Science and Aeronautics Division, will arrange with the non-U.S. sponsoring agency for the proposed participation on a no-exchange-of-funds basis, in which NASA and the non-U.S. sponsoring agency will each bear the cost of discharging their respective responsibilities. Depending on the nature and extent of the proposed cooperation, these arrangements may entail a letter of notification by NASA with a subsequent exchange of letters between NASA and the sponsoring governmental agency or a formal Agency-to-Agency Memorandum of Understanding (MOU).

6.4.3 Confirmation of Investigations

The investigations selected under this proposal will be implemented in two phases. The first phase will be for definition (formulation) only. The second phase will be for implementation, flight operations and data analysis. Progress from formulation to implementation is predicated on the successful completion of a NASA Non-Advocate Review (NAR). Based on the results of the NAR, the NASA Associate Administrator for Space Science will confirm the participation as originally selected, direct modification to meet project schedule and funding limitations, or terminate the proposed participation. At that time, firm commitments to performance specification, costs, schedule, and scope will be established.

7.0 CONCLUSION

The Gamma Ray Large Area Space Telescope will be the premier high energy gamma-ray observatory of the next decade. The science objectives of GLAST are broad ranging and cover many of the most exciting areas of current astrophysical research. We invite you to become a participant in this important and exciting scientific program.

Alan N. Bunner
Science Program Director
Structure and Evolution of the Universe

Edward J. Weiler
Associate Administrator
for Space Science

APPENDIX A

GENERAL INSTRUCTIONS AND PROVISIONS

I. INSTRUMENTATION AND/OR GROUND EQUIPMENT

By submitting a proposal, the investigator and institution agree that NASA has the option to accept all or part of the offeror's plan to provide the instrumentation or ground support equipment required for the investigation, or NASA may furnish or obtain such instrumentation or equipment from any other source as determined by the selecting official. In addition, NASA reserves the right to require use of Government instrumentation or property that subsequently becomes available, with or without modification, that meets the investigative objectives.

NOTICE TO ALL OFFERORS: In the event that a Principal Investigator employed by NASA is selected under this Announcement of Opportunity (AO), NASA will award prime contracts to non-Government participants, including co-investigators, hardware fabricators, and service providers, who are named members of the proposing team, as long as the selecting official specifically designates the participant(s) in the selection decision. Refer to Section J of Appendix B of this AO for proposal information which the selecting official will review in determining whether to incorporate a non-Government participant in the selection decision. Each NASA contract with a team member selected in this manner will be supported by an appropriate justification for other than full and open competition, as necessary.

II. TENTATIVE SELECTIONS, PHASED DEVELOPMENT, PARTIAL SELECTIONS, AND PARTICIPATION WITH OTHERS

By submitting a proposal, the investigator and the organization agree that NASA has the option to make a tentative selection pending a successful feasibility or definition effort. NASA has the option to contract in phases for a proposed experiment, and to discontinue the investigative effort at the completion of any phase. NASA may desire to select only a portion of the proposed investigation and/or that the individual participates with other investigators in a joint investigation. In this case, the investigator will be given the opportunity to accept or decline such partial acceptance or participation with other investigators prior to a NASA selection. Where participation with other investigators as a team is agreed to, one of the team members will normally be designated as its leader or contact point. NASA reserves the right not to make an award or cancel this AO at any time.

III. SELECTION WITHOUT DISCUSSION

The Government intends to evaluate proposals and award contracts without discussions with offerors. Therefore, each initial offer must contain the offeror's best terms from a cost or price and technical standpoint. However, the Government reserves the right to conduct discussions, if later determined by the Contracting Officer to be necessary.

IV. NONDOMESTIC PROPOSALS

The guidelines for proposals originating outside of the United States are the same as those for proposals originating within the United States, except that the additional conditions described in Sections 3.7 shall also apply.

V. TREATMENT OF PROPOSAL DATA

It is NASA policy to use information contained in proposals and quotations for evaluation purposes only. While this policy does not require that the proposal or quotation bear a restrictive notice, offerors or quoters should, in order to maximize protection of trade secrets or other information that is commercial or financial and confidential or privileged, place the following notice on the title page of the proposal or quotation and specify the information, subject to the notice by inserting appropriate identification, such as page numbers, in the notice. In any event, information (data) contained in proposals and quotations will be protected to the extent permitted by law, but NASA assumes no liability for use and disclosure of information not made subject to the notice.

RESTRICTION ON USE AND DISCLOSURE OF

PROPOSAL AND QUOTATION INFORMATION (DATA)

> The information (data) contained in (insert page numbers or other identification) of this proposal or quotation constitutes a trade secret and/or information that is commercial or financial and confidential or privileged. It is furnished to the Government in confidence with the understanding that it will not, without permission of the offeror, be used or disclosed for other than evaluation purposes; provided, however, that in the event a contract is awarded on the basis of this proposal or quotation, the Government shall have the right to use and disclose this information (data) to the extent provided in the contract. This restriction does not limit the Government's right to use or disclose this information (data), if obtained from another source without restriction.

VI. STATUS OF COST PROPOSALS

Submission of a Standard Form (SF) 1411 Contract Pricing Proposal Cover Sheet is required if the proposed amount is $500,000 or more. The investigator's institution agrees that the cost proposal submitted in response to the Announcement is for proposal evaluation and selection purposes, and that, following selection and during negotiations leading to a definitive contract, the institution may be required to resubmit or execute all certifications and representations required by law and regulation.

VII. LATE PROPOSALS

The Government reserves the right to consider proposals or modifications thereof received after the date indicated for such purpose, if the selecting official deems it to offer NASA a significant technical advantage or cost reduction. (See NFS 18-15.412.)

VIII. SOURCE OF SPACE INVESTIGATIONS

Investigators are advised that candidate investigations for space missions can come from many sources. These sources include those selected through the AO, those generated by NASA in-house research and development, and those derived from contracts and other agreements between NASA and external entities.

IX. DISCLOSURE OF PROPOSALS OUTSIDE THE GOVERNMENT

NASA may find it necessary to obtain proposal evaluation assistance outside the Government. Where NASA determines it is necessary to disclose a proposal outside the Government for evaluation purposes, arrangements will be made with the evaluator for appropriate handling of the proposal information. Therefore, by submitting a proposal, the investigator and institution agree that NASA may have the proposal evaluated outside the Government. If the investigator or institution desires to preclude NASA from using an outside evaluation, the investigator or institution should so indicate on the cover. However, notice is given that if NASA is precluded from using outside evaluation, it may be unable to consider the proposal.

X. EQUAL OPPORTUNITY

For any NASA contract resulting from this solicitation, the clause at FAR 52.222-26, "Equal Opportunity," shall apply.

XI. PATENT RIGHTS

A. For any NASA contract resulting from this solicitation awarded to other than a small business firm or nonprofit organization, the clause at NFS 18-52.227-70, New Technology, shall apply. Such contractors may, in advance of a contract, request waiver of rights as set forth in the provision at NFS 18-52.227-71, Requests for Waiver of Rights to Inventions.

B. For any NASA contract resulting from this solicitation awarded to a small business firm or nonprofit organization, the clause at FAR†52.227-11, Patent Rights -- Retention by the Contractor (Short Form), (as modified by NFS 18-52.227-11) shall apply.

XII. RIGHTS IN DATA

Any contract resulting from this solicitation will contain the Rights in Data - General clause: FAR 52.227-14.

XIII. SMALL AND SMALL DISADVANTAGED BUSINESS SUBCONTRACTING

A. Offerors are advised that, in keeping with Congressionally mandated goals, NASA seeks to place a fair portion of its contract dollars, where feasible, with small disadvantaged business concerns, women-owned small business concerns, Historically Black Colleges and Universities, and minority educational institutions, as these entities are defined in 52.219-8 and in 52.226-2 of the FAR. For this Announcement of Opportunity, NASA has established a recommended goal of 8 percent for the participation of these entities at the

prime and subcontract level. This goal is stated as a percentage of the total contract value. NASA encourages all offerors to meet or exceed this goal to the maximum extent practicable and to encourage the development of minority businesses and institutions throughout the contract period. Offerors will be evaluated on the proposed goal for participation of the entities listed above in comparison with the 8 percent goal and on the methods for achieving the proposed goal.

B. Offerors are advised that for NASA contracts resulting from this solicitation which offer subcontracting possibilities, exceed $500,000, and are with organizations other than small business concerns, the clause FAR 52.219-9 shall apply. Offerors who are selected under this AO will be required to negotiate subcontracting plans which include subcontracting goals for small, small disadvantaged, and women-owned small business concerns. Note that these specific subcontracting goals differ from the 8 percent goal described in paragraph A above, and need not be submitted with the proposal. Failure to submit and negotiate a subcontracting plan after selection shall make the offeror ineligible for award of a contract.

APPENDIX B

DETAILED GUIDELINES FOR PROPOSAL PREPARATION

[Note for Draft: The guidelines presented in this Draft AO are incomplete and will certainly be more specific, with additional detail, in the final AO. Your comments on the guidelines presented here are welcome.]

The following guidelines apply to the preparation of proposals in response to this GLAST AO. The material presented is a guide for the prospective proposer and is not intended to be all encompassing. The proposer should, however, provide information relative to those items applicable, as well as other items required by the AO. In the event of an apparent conflict between the guidelines in this Appendix and those contained within the body of the AO, those within the AO shall take precedence.

GENERAL GUIDELINES

All documents must be typewritten in English, use metric and standard astronomical units, and be clearly legible. Submission of proposal material by facsimile (fax), electronic media, videotape, or floppy disk is not acceptable. No proposal may reference a World Wide Web site for any data or material for completeness of the proposal.

In order to allow for recycling of proposals after the review process, all proposals and copies must be submitted on plain white paper only (e.g., no cardboard stock or plastic covers, no colored paper, etc.). Proposers are requested not to use three-ring binders. Photographs and color figures are permitted if printed on recyclable white paper only. The original signed copy (including cover page, certifications, and non-U.S. endorsements) must be bound in a manner that makes it easy to disassemble for reproduction. Except for the original, two-sided copies are preferred. Every side upon which printing appears will be counted against the page limits.

Single- or double-column format is acceptable. In complying with the page limit, no page may contain more than 45 lines of text and the type font must not be smaller than 12-point (i.e., less than or equal to 15 characters per inch). Figure captions must not be smaller than 12 point. Smaller font is allowed within figures and in the cost table. Proposals may include no more than four fold out pages (28 x 43 cm; i.e., 11 x 17 inches). All pages other than fold out pages shall be 8.5 x 11 inches or A4 European standard.

Proposals must be organized with readily identified sections corresponding to Sections C through J given below. Table B-1 and Table B-2 give restrictions on page count for the various sections.

INSTRUMENT PRINCIPAL INVESTIGATOR PROPOSALS

The proposal must consist of three volumes: Scientific Investigation and Technical Proposal, Management Proposal, and Cost Proposal. The Scientific Investigation and Technical Proposal (Volume 1) must consist of a main body and optional appendices. All pertinent information necessary for a sound scientific and technical assessment of the proposed investigation must be

contained in the 80 pages or less of the main body of the proposal. No appendices other than those in Table B-1 are permitted.

The Management Proposal (Volume 2) must summarize the management approach and the facilities and equipment required. The Cost Proposal (Volume 3) must summarize the estimated total investigation cost for all phases of the investigation, including data analysis. Cost Proposals are required for US investigations only. There are no page limits on the Management and Cost Proposals.

TABLE B-1: PAGE LIMITS FOR INSTRUMENT PRINCIPAL INVESTIGATOR PROPOSALS

Vol.	Section	Page Limits
1	Cover Page	1
1	Investigation Summary (Web Form)	no page limit
1	Table of Contents	no page limit
1	Executive Summary (including 2 page Fact Sheet)	6 **
1	Science Investigation and Technical Description	72 **
1	Education and Public Outreach, New Technology, and Small Disadvantaged Business Plan	6 **
1	Appendices: (no others permitted) Resumes (2 pages for PI, 1 page for each other investigator) Letter(s) of Endorsement Relevant Experience (2 pages per major team partner) Draft International Agreement(s) NASA PI Proposing teams (1 page) Reference List (optional) Acronyms List (optional)	no page limit, but small size encouraged
2	Management Proposal	no page limit
2	Appendix: Statement(s) of Work (SOW)	no page limit
3	Cost Proposal	no page limit
		** total must be 80 or fewer

INTERDISCIPLINARY SCIENTIST PROPOSALS

The proposal must consist of two parts, Scientific Investigation Proposal and Cost Proposal, bound in a single volume. The Scientific Investigation Proposal (Part 1) must consist of a main body and optional appendices. All pertinent information necessary for a sound scientific assessment of the proposed investigations must be contained in the 20 pages or less of the main body of the proposal. No appendices other than those in Table B-2 are permitted.

The Cost Proposal (Part 2) must summarize the estimated total investigation cost for all phases of the investigation, including data analysis. Cost Proposals are required for U.S. investigations only. There are no page limits on the Cost Proposal.

TABLE B-2: PAGE LIMITS FOR INTERDISCIPLINARY SCIENTIST PROPOSALS

Part	Section	Page Limits
1	Cover Page	1
1	Investigation Summary (Web Form)	no page limit
1	Table of Contents	no page limit
1	Executive Summary (Fact Sheet optional)	4 **
1	Science Investigation description	19 **
1	Appendices: (no others permitted) Resumes (2 pages for PI) Letter(s) of Endorsement Reference List (optional) Acronyms List (optional)	no page limit, but small size encouraged
2	Cost Proposal	no page limit
		** total must be 20 or fewer

A. COVER PAGE

A cover page must be a part of the proposal, but will not be counted against the page limit. It must be signed by the Principal Investigator and an official by title of the investigator's organization who is authorized to commit the organization. The full names of the Principal Investigator and the authorizing official, their addresses with zip code, telephone and fax numbers, and electronic mail addresses, shall be included.

B. INVESTIGATION SUMMARY (WEB FORM)

A summary of the proposed investigation must be included with the proposal. The Investigation Summary does not count against the page limit. The form to be used for this Summary is located at the World Wide Web address <http://props.oss.hq.nasa.gov/>. Proposers who experience difficulty in using this Web format should contact Debra Tripp (E-mail: deb.tripp@hq.nasa.gov) for assistance. A hard copy printout of the completed Investigation Summary form must be included with each copy of the proposal. It is NASA's intent to enter the Summaries of all selected investigations for its various programs into a publicly accessible data base. Therefore, the Investigation Summary may not contain any proprietary or confidential information that the submitter wishes to protect from public disclosure.

C. TABLE OF CONTENTS

The proposal shall contain a table of contents, which will not be counted against the page limit. This table of contents should parallel the outlines provided below.

D. EXECUTIVE SUMMARY INCLUDING FACT SHEET

A Fact Sheet that provides a brief summary of the proposed investigation must be included in IPI proposals. The information conveyed on the Fact Sheet must include the following: science objectives (including the importance of the science to the NASA space science program and the GLAST mission objectives), science payload, key technical characteristics, mission management (including teaming arrangements), schedule, and cost estimate. Other relevant information, including figures or drawings, may be included at the proposer's discretion. The Fact Sheet is restricted to two pages (preferably a double-sided single sheet).

The executive summary must provide an overview of the investigation, including its scientific objectives, instrumentation, operational approach, educational and societal opportunities, management plan, and cost plan.

E. SCIENCE INVESTIGATION

The science section must describe the scientific objectives of the proposed investigation, including the value of the investigation to space science, high energy astrophysics, and the GLAST mission. It must provide a discussion of the scientific products and how the science products and data obtained will be used to fulfill the scientific objectives. A discussion of how the science data will be obtained, including a plan for delivery of the products, and the individuals responsible for the data delivery, must also be provided

1. Scientific Goals and Objectives. This section must consist of a discussion of the goals and objectives of the investigation, their value to high energy astrophysics, and their relationships to past, current, and future investigations and missions. It must describe the history and basis for the proposal and discuss the need for such an investigation. An overview of the mission, identifying the targets and operational scenario, must be provided.

2. Science Measurements. The measurements to be taken in the course of the mission, the data to be returned, and the approach that will be taken in analyzing the data to achieve the scientific objectives of the investigation must be discussed. This description must identify the experiments to be performed (imaging, spectroscopy, etc.), the quality of the data to be returned (resolution, coverage, pointing accuracy, measurement precision, etc.), and the quantity of data to be returned (bits, images, volume, etc.). The relationship between the data products generated and the scientific objectives must be explicitly described, as should the expected results. It is assumed that the above information will constitute the "Baseline Mission."

3. Descope Options and the Performance Floor. This section must also identify a series of descope options which save up to 10% of developmental costs and which ultimately result in a minimum acceptable data and scientific return for the mission (the "Performance Floor"), below which the mission would not be worth pursuing. The value of the science in advancing space science and high energy astrophysics at the Performance Floor must be discussed. A description of the descope options available to the team, their phasing, their savings to the program, and their effect on meeting the scientific objectives of the mission, as the mission is descoped from the Baseline Mission to the Performance Floor, must be discussed. The descope plan must be appropriate for a variety of circumstances including recovery from developmental problems as well as a reduction in the NASA funds available for development.

F. SCIENCE IMPLEMENTATION (INSTRUMENT PRINCIPAL INVESTIGATOR PROPOSALS ONLY)

1. Instrumentation. This section must fully describe the instrumentation and the criteria used for its selection. It must identify the individual instruments and instrument systems, including their physical characteristics (e.g., mass, power, volume) and requirements. It must indicate items that are proposed to be newly developed, as well as any existing instrumentation or design/flight heritage.

A preliminary description of each instrument design with a block diagram showing the instrument systems and their interfaces must be included, along with a description of the estimated performance of the instrument. Performance characteristics must be related to the measurement and investigation objectives as stated in the proposal. Such characteristics include a discussion of the data rates, fields of view, resolution, precision/sensitivity, pointing accuracy, etc. It must explain how the instrument design will achieve the stated performance and describe the technical justification and rationale for why the instrument will perform as described.

The instrument background rejection scheme must be described in detail, with particular attention to the instrument data system hardware and software.

A traceability matrix showing how the proposed instrument design is derived from the stated objectives, requirements, and constraints of the proposed investigation, must be provided.

2. Instrument Operations, Data Reduction and Analysis. The overall concept for performing reduction and analysis of pre- and post- flight data must be described. Proposers must identify all computer hardware and software required to support the instrument operations and data analysis. The IPI proposer should bear in mind his or her responsibility to provide instructions on the use and operation of his or her instrument for outside observers, and to provide for the delivery of the data from the instrument in a useable format at a to-be-specified GLAST science operations facility.

3. Science Team. This section must identify the mission science team, and the activities of that team must be described in detail. The capabilities and experience of all members of the proposed science team must be described. In addition, the role of each science team member in the investigation must be explicitly defined.

G. TECHNICAL APPROACH (INSTRUMENT PRINCIPAL INVESTIGATOR PROPOSALS ONLY)

1. Payload Integration. This section must characterize the interface between the instruments and the spacecraft. These include, but are not limited to: volumetric envelope, fields of view, weight, power requirements, thermal requirements, command and telemetry requirements, sensitivity to and generation of contamination (e.g., gaseous effluents, electromagnetic interference and susceptibilities, etc.), data processing requirements, as well as the planned process for physically and analytically integrating them with the flight system. The testing strategy of the science payload, prior to integration with the spacecraft, must be discussed.

2. Manufacturing, Integration, and Test. This section must describe the manufacturing strategy to produce and test the hardware/software necessary to accomplish the mission, including a description of the main processes/procedures planned in the fabrication of flight hardware, software, production personnel resources, incorporation of new technology/materials, and the preliminary test and verification program. Describe the approach for transitioning from design to manufacturing and specify data products which will be used to assure producibility and adequate tooling availability.

   The approach, techniques, and facilities planned for integration, test and verification, and launch operations phases, consistent with the proposed schedule and cost, must be described. A preliminary schedule for manufacturing, integration, and test activities must be included. A description of the planned end items, including engineering and qualification hardware, must be included.

H. PHASE A/B DEVELOPMENT TECHNICAL DEFINITION PLAN (INSTRUMENT PRINCIPAL INVESTIGATOR PROPOSALS ONLY)

This section must describe the proposer's plan for updating the instrument design to reach the maturity level required for a PDR, updating any existing hardware to a prototype, and supporting the flight of the prototype on a long duration suborbital balloon. This section must identify the trades planned, the process for conducting and documenting those trades, and the process for interaction between the IPI team members.

I. EDUCATION, PUBLIC OUTREACH, NEW TECHNOLOGY, AND SMALL DISADVANTAGED BUSINESS PLAN (INSTRUMENT PRINCIPAL INVESTIGATOR PROPOSALS ONLY)

The education, public outreach, new technology, and small disadvantaged business section shall provide a summary of the benefits offered by the proposal beyond the scientific benefits. This plan must reflect the proposer's commitment to achieving the goals of the OSS education and public outreach strategy as reflected in the Implementation Plan for that strategy, participation of small disadvantaged business, and the use of new technology in the implementation of the investigations. Further information on the OSS' broad approach to education and outreach can be found in Implementing the Office of Space Science (OSS) Education and Outreach Strategy (see contents of the GLAST Bibliography, Appendix C). Guidance on the use of new technology in investigations can be found in the OSS Integrated Technology Strategy in the GLAST Bibliography.

J. APPENDICES

The following additional information is required to be supplied with the IPI proposal. This information can be included as Appendices to the proposal, and as such, will not be counted within the specified page limit.

1. Resumes. Provide resumes for all key personnel identified in the Management section.

2. Letters of Endorsement. Letters of endorsement must be provided from all organizations participating in the investigation. Letters of endorsement should be signed by both the lead representative from each organization represented on the team, and by institutional and Government officials authorized to commit their organizations to participation in the proposed investigation.

3. NASA Principal Investigator Proposing Teams. Proposals submitted by NASA employees as Principal Investigators must contain the following information concerning the process by which non-Government participants were included in the proposal. The proposal should (i)†indicate that the supplies or services of the proposed non-Government participant(s) are available under an existing NASA contract; (ii) make it clear that the capabilities, products, or services of these participant(s) are sufficiently unique to justify a sole source acquisition; or (iii)†describe the open process that was used for selecting proposed team members. While a formal solicitation is not required, the process cited in (iii) above should include at least the following competitive aspects: notice of the opportunity to participate to potential sources; submissions from and/or discussions with potential sources; and objective criteria for selecting team members among interested sources. The proposal should address how the selection of the proposed team members followed the objective criteria and is reasonable from both a technical and cost standpoint. The proposal should also include a representation that the Principal Investigator has examined his/her financial interests in or concerning the proposed team members and has determined that no personal conflict of interest exists. The proposal must provide a certification by a NASA official superior to the Principal Investigator verifying the process for selecting contractors as proposed team members, including the absence of conflicts of interest.

4. Relevant Experience and Past Performance (IPI Proposals Only). Relevant experience and past performance (successes and failures) of the major team partners in meeting cost and schedule constraints in similar projects within the last ten years should be discussed. A description of each project, its relevance to the proposed investigation, cost and schedule performance, and points of contact (including addresses and phone numbers), should be provided.

5. International Agreement(s) (IPI Proposals Only). Draft International Agreement(s) are required for all non-U.S. partners in the investigation. An example of an International Agreement is included in the GLAST Bibliography (see Appendix C).

6. References List. Proposals may provide, as an appendix, a list of reference documents and materials used in the proposal. The documents and materials themselves cannot be submitted except as a part of the proposal.

7. Acronyms List. Proposals may provide a list of acronyms.

K. MANAGEMENT PLAN (INSTRUMENT PRINCIPAL INVESTIGATOR PROPOSALS ONLY)

This section sets forth the investigator's approach for managing the work, the recognition of essential management functions, and the overall integration of these functions. This section must specifically discuss the decision-making process to be used by the team, focusing particularly on the roles of the Principal Investigator and Project Manager in that process. The management plan gives insight into the organizations proposed for the work, including the internal operations and lines of authority with delegations, together with internal interfaces and relationships with NASA, major subcontractors, and associated investigators. It also identifies the institutional commitment of all team members, and the institutional roles and responsibilities. The use of innovative processes, techniques, and activities by mission teams in accomplishing their objectives is encouraged; however, they should be employed only when cost, schedule, or technical improvements can be demonstrated and specific enabling assumptions are identified.

1. Management Processes and Plans. This section must describe the management processes and plans necessary for the logical and timely pursuit of the work, accompanied by a description of the work plan. This section must also describe the proposed methods of hardware and software acquisition. The management processes which the investigator team proposes, including the relationship between organizations and key personnel must be discussed, including the following, as applicable: systems engineering and integration; requirements development; configuration management; schedule management; team member coordination and communication; progress reporting, both internal and to NASA; performance measurement; and resource management. This discussion must include all phases of the mission including preliminary analysis, technical definition, the design and development, and operations phases, along with the expected products and results from each phase. Unique tools, processes, or methods that will be used by the investigation team must be clearly identified and their benefits discussed. All project elements must be covered to assure a clear understanding of project-wide implementation.

2. Schedules. The schedule and work flow for the complete mission life-cycle must be clearly defined, and the method and tools to be used for internal review, control, and direction discussed. Schedules for all major activities, interdependencies between major items, deliveries of end items, critical paths, schedule margins, and long-lead procurement needs (defined as hardware procurements required before the start of Phase C/D) must be clearly identified.

3. Team Member Responsibilities. This section must describe the roles, responsibilities, time commitment, and experience of all team member organizations and key personnel, with particular emphasis placed on the responsibilities assigned to the Principal Investigator, the Project Manager, Co-Investigators, and other key personnel. In addition, information must be provided which indicates what percentage of time key personnel will devote to the mission, the duration of service, and how changes in personnel will be accomplished. (Note: The experience of the PI and science team members does not need to be included in this section since it would have been addressed in their vitae.)

4. Organizational Structure. The management organizational structure of the investigation team must be described in the proposal. The proposal must describe the responsibilities of each team member organization and its contributions to the investigation. Each key position, including its roles and responsibilities, how each key position fits into the organization, and the basic qualifications required for each position, must be described. A discussion of the unique or proprietary capabilities that each member organization brings to the team, along with a description of the availability of personnel at each partner organization to meet staffing needs, must be included. The contractual and financial relationships between team partners must be discussed.

   If experience for a partner is not equivalent to, or better than, the requirements for the proposed mission, explain how confidence can be gained that the mission can be accomplished within cost and schedule constraints.

5. Experience and Commitment of Key Personnel. Provide a history of experience explaining the relationship of the previous experience to each key individual's role; include the complexity of the work and the results. Include changes in scope during development, if appropriate.

   a. Principal Investigator. The role(s), responsibilities, and time commitment of the Principal Investigator must be discussed. Provide a reference point of contact, including address and phone number.

   b Project Manager. The role, responsibilities, time commitment, and experience of the Project Manager must be discussed. Provide a reference point of contact, including address and phone number.

   c. Other Key Personnel. The roles, responsibilities, time commitments, and experience of other key personnel in the investigation should be described.

6. Risk Management. This section must describe the approach to, and plans for, risk management to be taken by the team, both in the overall instrument design and in the individual systems and subsystems. Particular emphasis must be placed on describing how the various elements of risk, including new technologies used, will be managed to ensure successful accomplishment of the mission within cost and schedule constraints. Investigations dependent on new technology will not be penalized for risk if a credible plan including cost and schedule for implementing the new technology is shown, and adequate backup plans are described to ensure success of the investigation.

A summary of margins and reserves in cost and schedule must be identified by Phase and project element and year and the rationale for them discussed. The specific means by which integrated costs, schedule, and technical performance will be tracked and managed must be defined. Specific reserves and the timing of their application must be described. Management of the reserves and margins, including who in the management organization manages the reserves and when and how the reserves are released, must be discussed. This should include the strategy for maintaining reserves as a function of cost-to-completion. All funded schedule margins must be identified. The relationship between the use of such reserves, margins, potential descope options, and their effect on cost, schedule, and performance must be fully discussed. This section must identify the latest possible dates at which descope options may be implemented and the procedure by which they would be accomplished.

7. Mission Assurance and Safety. This section must describe the process by which mission success is assured and safety is achieved. This section must describe mission assurance and safety plans, including plans for reviews, problem/failure resolution, hazard mitigation, inspections, quality assurance, reliability, parts selection and control, safety processes, and software validation activities, compatible with industry best practices and ISO 9000 quality standards.

8. Reporting and Reviews. This section must clearly describe the approach to reporting progress to the Government and the reviews the Government is invited to attend to provide independent oversight. The process, including the individual or organization responsible for reporting integrated cost, schedule, and technical performance must be discussed. A description of the information to be presented must be included.

9. Facilities and Equipment. All major facilities, laboratory equipment, and ground support equipment (GSE) (including those of the team's proposed contractors and those of NASA and other U.S. Government agencies) essential to the mission in terms of its system and subsystems are to be indicated, distinguishing, insofar as possible, between those already in existence and those that will be developed in order to execute the investigation. The outline of new facilities and equipment must also indicate the lead time involved and the planned schedule for construction, modification, and/or acquisition of the facilities.

L. STATEMENT(S) OF WORK (INSTRUMENT PRINCIPAL INVESTIGATOR PROPOSALS ONLY)

Provide draft Statement(s) of Work for all potential contracts with NASA. These Statement(s) of Work must (as a minimum) be for each contract option (i.e., Formulation (Phase A/B), Implementation (Phase C/D/E)) and clearly define all proposed deliverables (including science data) for each option, potential requirements for Government facilities and/or Government services, and a proposed schedule for the entire mission.

M. COST PLAN (INSTRUMENT PRINCIPAL INVESTIGATOR PROPOSALS ONLY)

The cost plan must provide information on the anticipated costs for all phases of the mission. A detailed cost proposal is required, including a completed SF 1411, for the formulation phase (Phase A/B). Cost estimates are required for the follow-on implementation phase (Phase C/D) and operations phase (Phase E), including a description of the estimating technique used to develop the cost estimates. A discussion of the basis of the estimate must be provided with a discussion of heritage and commonality with other programs. All costs, including all contributions made to the investigation, must be included. Proposers must complete a summary of total mission cost phased by fiscal year as shown in Table B-3. In addition, for each phase for the investigation (B, C/D, and E), a Time Phased Cost Breakdown for each Work Breakdown Structure (WBS) element, as shown in Table B-4, must be completed.

It is anticipated that during the period of performance of the proposed mission, NASA will implement full cost accounting for NASA Centers or other Government laboratories. To plan for this, proposers must include all contributions provided by NASA Centers, including Civil Servant services, as well as the cost for the use of Government facilities and equipment. All direct and indirect costs associated with the work performed at NASA Centers must be fully costed and accounted for in the proposal. Teams should work with their respective NASA Centers to develop estimates for these costs.

The inflation index provided in Table B-5 should be used to calculate all real-year dollar amounts, unless an industry forward pricing rate is used. If something other than the provided inflation index is used, the rates used should be documented.

All costs shall include all burdens and profit/fee in real-year dollars by fiscal year, assuming the inflation rates used by NASA or specifically identified industry forward pricing rates.

1. Formulation Phase (Phase A/B) Cost Proposal. This section provides a detailed cost proposal for performing the Phase A/B study. Detailed plans for the study should be described, but reference may be made to the Technical Approach and Management sections of the proposal as appropriate.

    a. Contract Pricing Proposal Cover Sheet. A completed Contract Pricing Proposal Cover Sheet, SF 1411, must be included with the proposal for the Phase A/B study. The SF 1411 must be signed by the proposer's authorized representative.

    b. Work Breakdown Structure. A Work Breakdown Structure (WBS) must be included for Phase B of the mission. The structure of the WBS should be consistent with the plans set forth in the Technical Approach and Management sections of the proposal and the Statement of Work provided as an Appendix to the proposal.

c. Workforce Staffing Plan. Provide a workforce staffing plan which is consistent with the Work Breakdown Structure. This workforce staffing plan should include all team member organizations and should cover all management, technical (scientific and engineering), and support staff. The workforce staffing plan should be phased by month. Time commitments for the Principal Investigator, Project Manager, and other key personnel should be clearly shown.

d. Proposal Pricing Technique. Describe the process and techniques used to develop the Phase A/B cost proposal. Provide a description of the cost-estimating model(s) and techniques used in the Phase A/B cost estimate. Discuss the heritage of the models and/or techniques applied to this estimate, including any known differences between missions contained in the model's data base and key attributes of the proposed mission. Include the assumptions used as the basis for the Phase A/B cost and identify those which are critical to cost sensitivity in the investigation. Identify any "discounts" assumed in the cost estimates for business practice initiatives or streamlined technical approaches. Describe how these have been incorporated in the cost estimate and will be managed by the investigation team.

e. Formulation Phase (Phase A/B) Time-Phased Cost Summary. Provide a summary of the total Phase A/B costs consistent with Table B-4. The Phase A/B cost summary should be developed consistent with the Work Breakdown Structure and should include all costs to NASA along with all contributed costs. The Phase A/B time phased cost summary should be phased by month.

f. Cost Elements Breakdown. To effectively evaluate the Phase A/B cost proposals, NASA requires costs and supporting evidence stating the basis for the estimated costs. The proposal will include, but is not limited to:

   i. Direct Labor.
      (1) Explain the basis of labor-hour estimates for each of the labor classifications.
      (2) State the number of productive work-hours per month.
      (3) Provide a schedule of the direct labor rates used in the proposal. Discuss the basis for developing the proposed direct labor rates for the team member organizations involved; the forward-pricing method (including midpoint, escalation factors, anticipated impact of future union contracts, etc.); and elements included in the rates, such as overtime, shift differential, incentives, allowances, etc.

(4) If available, submit evidence of Government approval of direct labor rates for proposal purposes for each labor classification for the proposed performance period.

(5) If Civil Servant labor is to be used in support of the Phase A/B study, but is not to be charged directly to the investigation, then this labor must be considered as a contribution by a domestic partner, subject to the same restrictions as other contributions by domestic or foreign partners. A discussion of the source of funding for the Civil Servant contributions must be provided.

ii. Direct Material. Submit a summary of material and parts costs for each element of the WBS.

iii. Subcontracts. Identify fully each effort (task, item, etc. by WBS element) to be subcontracted, and list the selected or potential subcontractors, locations, amount budgeted/proposed, and types of contracts. Explain the adjustments, if any, and the indirect rates (or burdens) applied to the subcontractors' proposed amounts anticipated. Describe fully the cost analysis or price analysis and the negotiations conducted regarding the proposed subcontracts.

iv. Other Direct Costs.

(1) Travel, Relocation, and Related Costs. Provide a summary of the travel and relocation costs including the number of trips, duration, and purpose of the trips.

(2) Computer. Provide a summary of all unique computer-related costs.

(3) Consultants. Indicate the specific task area or problem requiring consultant services. Identify the proposed consultants, and state the quoted daily rate, the estimated number of days, and associated costs (such as travel), if any. State whether the consultant has been compensated at the quoted rate for similar services performed in connection with Government contracts.

(4) Other. Explain and support any other direct costs included in the Phase A/B proposal in a manner similar to that described above.

v. Indirect Costs.

(1) List all indirect expense rates for the team member organizations. Indirect expense rates (in the context of this AO) include labor overhead, material overhead, general and administrative (G&A) expenses, and any other cost proposed as an allocation to the proposed direct costs.

(2) If the proposal includes support services for which off-site burden rates are used, provide a schedule of the off-site burden rates. Include a copy of the company policy regarding off-site vs. on-site effort.

(3) If available, submit evidence of Government approval of any/all projected indirect rates for the proposed period of performance. Indicate the status of rate negotiations with the cognizant Government agency, and provide a comparative listing of approved bidding rates and negotiated actual rates for the past five (5) fiscal years.
(4) Discuss the fee arrangements for the major team partners.

2. Implementation Phase (Phase C/D) Cost Estimate. This section provides a cost estimate for performing the Implementation Phase (Phase C/D) portion of the mission. The Phase C/D cost estimates should correlate with the plans set forth in the Science, Technical Approach, and Management sections of the proposal. In completing this section, the following guidelines will apply:

   a. Work Breakdown Structure. A Work Breakdown Structure (WBS) should be included for the Implementation Phase (Phase C/D) of the mission. The WBS shall be described to the subsystem level (e.g. tracker, data acquisition, calorimeter, etc.) for the instrument. All other elements of the WBS should be to the major task level (Project Management, Systems Engineering, Ground Support Equipment, etc.).

   b. Cost Estimating Technique. Describe the process and techniques used to develop the Phase C/D cost estimate. Provide a description of the cost-estimating model(s) and techniques used in your Phase C/D cost estimate. Discuss the heritage of the models applied to this estimate including any known differences between missions contained in the model's data base and key attributes of the proposed mission. Include the assumptions used as the basis for the Phase C/D cost and identify those which are critical to cost sensitivity in the investigation. Identify any "discounts" assumed in the cost estimates for business practice initiatives or streamlined technical approaches, and the basis for these discounts. Describe how these have been incorporated in the cost estimate and will be managed by the investigation team.

   c. Workforce Staffing Plan. Provide a workforce staffing plan (including civil service) which is consistent with the Work Breakdown Structure. This workforce staffing plan should include all team member organizations and should cover all management, manufacturing, technical (scientific and engineering), and support staff. The workforce staffing plan should be phased by fiscal year. Time commitments for the Principal Investigator, Project Manager, and other key personnel should be clearly shown.

   d. Phase C/D Time-Phased Cost Summary. Provide a summary of the total Phase C/D costs consistent with Table B-4. The Phase C/D cost summary should be developed consistent with the Work Breakdown Structure and should include all costs to NASA, along with all contributed costs. The Phase C/D time phased cost summary should be phased by fiscal year.

3. Mission Operations (Phase E) Cost Estimate. This section provides a cost estimate for performing the Mission Operations for Phase E. Reference may be made to the Technical Approach and Management sections of the proposal. In completing this section, the guidelines for Phase C/D apply.

4. Total Mission Cost (TMC) Estimate. This section must summarize the estimated costs to be incurred in Phases A through E including: Formulation Phase (Phase A/B), Implementation Phase (Phase C/D), and Mission Operations and Data Analysis Phase (Phase E). The total mission cost estimate should be developed consistent with the Work Breakdown Structure.

This section must include detailed plans for all aspects of the mission not discussed elsewhere in the proposal, including: any activities associated with social or educational benefits. Reference may be made to the Technical Approach section of the proposal. In completing this section, the following guidelines will apply:

a. Total Mission Cost. A summary of the Total Mission Cost time-phased by fiscal year must be included in the format shown in Table B-3. Dollar amounts must be shown in real-year dollars. Total Mission Costs must be summarized in real-year dollars in the last column of this table. This summary should represent the optimum funding profile for the mission. Assets provided as contributions by international or other partners should be included, and clearly identified, as separate line items.

TABLE B-3

TOTAL MISSION COST FUNDING PROFILE TEMPLATE

(FY costs* in Real Year Dollars, Totals in Real Year Dollars)

Item	FY00	FY01	FY02	FY03	FY04	FY05	...	FY10	Total (Real Yr.)
Phase A/B	$	$	$	$	$	$	$	$	$
- Organization A									
- Organization B									
- etc.									
Phase C/D	$	$	$	$	$	$	$	$	$
- Organization A									
- Organization B									
- etc.									
Phase E	$	$	$	$	$	$	$	$	$
- Organization A									
- Organization B									
- etc.									
Other (specify)	$	$	$	$	$	$	$	$	$
Cost to NASA (Total)	$	$	$	$	$	$	$	$	$
Additional Contributions by Organization (Foreign or Domestic) to:									
Total Phase B	$	$	$	$	$	$	$	$	$
- Organization A									
Total Phase C/D	$	$	$	$	$	$	$	$	$
- Organization A									
Total Phase E	$	$	$	$	$	$	$	$	$
- Organization A									
Other (specify)	$	$	$	$	$	$	$	$	$
Contributed Costs (Total)	$	$	$	$	$	$	$	$	$
						Mission Totals			$

* Costs should include all costs including fee

TABLE B-4

TIME PHASED COST BREAKDOWN BY WBS AND MAJOR COST CATEGORY

(Phased costs in Real Year Dollars, Total costs in Real Year Dollars)

WBS/Cost Category Description	Month 1 or FY1	Month 2 or FY2	ï ï ï	Month n or FYn	Total (RY$)
Total Direct Labor Cost	$	$	$	$	$
WBS 1.0 Management					
WBS 2.0 Instrument					
WBS 2.1 Subsystem A					
WBS 2.2 Subsystem B					
etc.					
Total Subcontract Costs	$	$	$	$	$
WBS # and Description					
:					
etc.					
Total Materials & Equipment Cost	$	$	$	$	$
WBS # and Description					
:					
etc.					
Total Reserves	$	$	$	$	$
WBS # and Description					
:					
etc.					
Total Other Costs	$	$	$	$	$
WBS # and Description					
:					
etc.					
Fee					
Other (Specify)					
Total Contract Cost	$	$	$	$	$

Total Contributions (Foreign or Domestic)	$	$	$	$	$
Organization A:					
WBS # and Description					
:					
etc.					
Organization B:					
WBS # and Description					
:					
etc.					

TOTAL COST FOR TIME PHASE	$	$	$	$	$

TABLE B-3

NASA NEW START INFLATION INDEX

Fiscal Year	1998	1999	2000	2001	2002	2003	2004	2005
Inflation Rate	0.0%	3.8%	4.1%	3.9%	3.9%	3.9%	3.9%	3.9%
Cumulative Inflation Index	1.0	1.038	1.081	1.123	1.166	1.212	1.259	1.308

Use an inflation rate of 3.9% for years beyond 2005.

APPENDIX C

BIBLIOGRAPHY OF RELEVANT REPORTS AND APPLICABLE DOCUMENTS

The GLAST Bibliography includes documents available electronically via the Internet, as well as paper copy. Proposers are requested to access the document electronically where possible. Only limited paper copies of documents are available. Please note that not all documents are available via the GLAST Bibliography, but access information is provided.

It is incumbent upon the proposer to ensure that the documents used in proposal preparation are of the date and revision listed in the Announcement of Opportunity or this Appendix.

The GLAST Bibliography is accessible on the World Wide Web at the GLAST AO homepage at <http://glast.gsfc.nasa.gov/ao/>.

Requests for paper copies should be submitted in writing to:

GLAST Bibliography
GLAST Project Office
Code XXX
Goddard Space Flight Center
National Aeronautics and Space Administration
Greenbelt, MD XXX
Fax Number: XXX
E-mail: XXX

GLAST REQUIREMENTS DOCUMENTS

GLAST Science Requirements Document (December 1998)

This document is was written by the GLAST Facility Science Team. It has been accepted by the GLAST Program Office at NASA Headquarters. It specifies the principal science objectives of the GLAST mission and the requirements those objectives place on the GLAST instrument(s).

GLAST Instrument to Spacecraft Interface Requirements Document (Draft)

This document is a product of the GLAST Project Office at Goddard Space Flight Center. It specifies the technical interface requirements for any instrument proposed as part of a scientific investigation using GLAST.

OFFICE OF SPACE SCIENCE STRATEGIES AND POLICIES

The Space Science Enterprise Strategic Plan: Origins, Evolution, and Destiny of the Cosmos and Life (November 1997)

This document is a concise statement of the goals and outlook of NASA's Space Science Enterprise. It is a compilation of the major ideas described in more detail in the context of the overall NASA Strategic Plan.

The Evolving Universe: Structure and Evolution of the Universe Roadmap 2000-2020 (April 1997)

This document prioritizes the goals and plans for the Structure and Evolution of the Universe science theme within the Office of Space Science.

Partners in Education: A Strategy for Integrating Education and Public Outreach into NASA's Space Science Programs (March 1995)

This document describes the overall strategy for integrating education and public outreach into NASA's space science programs.

Implementing the Office of Space Science (OSS) Education/Public Outreach Strategy (October 1996)

This document describes the overall approach to implementing the education and public outreach strategy of the Office of Space Science.

OSS Integrated Technology Strategy (April 1994)

This document describes efforts to manage technology infusion into future space science missions and to promote technology transfer to the private sector.

SPACE SCIENCE SUPPORTING DOCUMENTS

NAS/NRC Report: A New Science Strategy for Space Astronomy and Astrophysics (1997)

Report of the Task Group on Astronomy and Astrophysics. A study undertaken by the Space Science Board to determine the principal scientific issues that the discipline of space science would face during the period 1995-2015.

Recommended Priorities for NASA's Gamma Ray Astronomy Program 1996 - 2010 (April 1997)

Report of the Gamma Ray Astronomy Program Working Group. A study undertaken by NASA to determine the priorities for gamma ray astronomy after the Compton Gamma Ray Observatory.

GLAST RELATED DOCUMENTS

Gamma Ray Large Area Space Telescope Instrument Technology Development Program, NRA 98-217-02, NASA Office of Space Science, January 16, 1998.

A NASA Research Announcement soliciting advanced technology development for GLAST Large Area Telescope concepts.

GENERAL GUIDELINE AND REQUIREMENTS DOCUMENTS

NHB 7120.5 -- Management of Major System Programs and Projects (November 1993)

This NASA Handbook provides a reference for typical activities, milestones, and products in the development and execution of NASA missions.

ISO 9000 Series

The following ISO 9000 quality documents describe current national and NASA standards of quality processes and procedures.

- American National Standard, "Quality Systems - Model for Quality Assurance in Design, Development, Production, Installation, and Servicing," ANSI/ASQC Q9001-1994.
- "Quality Management and Quality System Elements - Guidelines," ANSI/ASQC Q9004-1-1994.
- "Quality Management and Quality Assurance Standards - Guidelines for Selection and Use," ANSI/ASQC Q9000-1-1994
- "ISO 9000 and NASA," Code Q presentation, April 24, 1995.

Note: The first three ISO 9000-related documents are copyrighted and cannot be reproduced without appropriate compensation. For copies contact:

American Society for Quality Control (ASQC)
P.O. Box 3066
Milwaukee, WI 53201-3066
800-248-1946

PROCUREMENT-RELATED INFORMATION

Electronic versions only are available for the following:

Federal Acquisition Regulations (FAR) General Services Administration

<http://www.arnet.gov/far/>

NASA FAR Supplement Regulations

<http://www.hq.nasa.gov/office/procurement/regs/nfstoc.htm>

NASA Financial Management Manual

<http://www.hq.nasa.gov/fmm/>

NPG 5800.1D -- Grant and Cooperative Agreement Handbook (July 1996)

<http://procure.msfc.nasa.gov/grcover.htm>

APPENDIX D

GLAST SCIENTIFIC MANAGEMENT, ORGANIZATION, AND RESPONSIBILITIES

The purpose of this Appendix is to describe the management approach for planning and implementing the GLAST Program and the authority, responsibilities, and interfaces of key participants in the project.

1.0 PROJECT ORGANIZATION

The Goddard Space Flight Center (GSFC) has been designated by the NASA Office of Space Science as the Program/Project Management Center for GLAST.

2.0 PROGRAM/PROJECT PHASING

For planning purposes, the phasing is based on a FY00 start for definition activities and a FY02 new start for implementation.

Scientific investigations are to be selected in response to this AO and confirmed for implementation as described in Section 6.4.3 of the AO.

After selection for definition, NASA GSFC will contract with the selected Principal Investigator's organizations for the definition activities. During the definition phase, each IPI and his/her team will establish a preliminary design, deliver a prototype based on the preliminary design, support a balloon flight of the prototype, and update the cost proposal and management plan for the implementation phase.

3.0 DEFINITION

Funding for IPI proposals during the definition phase will be provided by NASA to support the following tasks:

1. Preparation of a preliminary instrument design in sufficient detail to permit verification of interface and support requirements, verify the development cost of the instrument and confirm the ability of the IPI to meet project milestones. The IPI must demonstrate that s/he has sufficient design data necessary to proceed to the implementation of the instrument.
2. Upgrading of a prototype to fly on a long duration balloon and the support of that flight.
3. Preparation of an updated cost proposal.
4. Participation in project meetings such as Project Reviews and Science Working Group meetings.

4.

4.0 Implementation, Flight Operations and Data Analysis

Authority to proceed to the implementation phase will be given by the NASA Associate Administrator for Space Science. During the implementation phase, NASA's GSFC will fund the IPI's for hardware development, scientific support, preliminary data analysis, and flight data reduction and analysis. NASA's GSFC will fund the IDS's for final definition of their investigations, IDS support required by NASA, and reduction and analysis of data from their investigations. The following general tasks will be funded during the development phase:

1. Program management including provision for detailed cost and schedule tracking and reporting.
2. Studies and analyses.
3. Design, development, fabrication, test, calibration and delivery of flight hardware and GSE.
4. Documentation required to enable others to integrate the flight hardware.
5. Support of flight operations.
6. Support of data reduction and analysis.
7. Participation in meetings and reviews.

5.0 Science Management Functions

5.1 Project Scientist (PS)

The PS is responsible for maximizing the scientific return from the GLAST within Project constraints. The PS will be the primary point of contact between the IPI, IDS, and the Project on matters of scientific interest on a daily basis. He will be responsible for coordinating overall observatory scientific systems, mission operations, data reduction, and analysis.

5.2 Instrument Principal Investigator (IPI)

An IPI has full responsibility for the conduct of the selected investigation including the development, performance, cost, and timely delivery of the instrument and any associated software and documentation required for operation and for analysis of data. The IPI will direct and coordinate instrument development, checkout, calibration, and the reduction and analysis of his or her portion of the flight data and publication of the scientific results. The IPI will have an ongoing responsibility for a period of 30 months after post-launch checkout to assist in the operation, calibration, and data processing associated with the instrument; to prepare user documentation; to assist other observers in its use; and to assist in the preparation of the data for deposit in a specified archive in a form that is usable by other investigation.

Other specific duties of the IPI include:

1. Allocating work assignments among and managing the activities of the Co-Investigators
2. Ensuring that the design of the instrument is appropriate to the objectives of the investigation; that the environment and interface constraints are met and are compatible with schedules, budgets, system specifications, an standards
3. Participating in planning and executing mission operations
4. Developing and maintaining adequate documentation regarding the investigation
5. Planning and conducting suitable calibration of the science instrumentation
6. Planning and providing suitable means for the reduction and analysis of his portion of flight data on a timely basis consistent with overall GLAST plans and schedules

5.3 Interdisciplinary Scientist (IDS)

The IDS will be responsible for attending reviews and participating in other activities required to assist the GLAST Project in maintaining a broad and critical scientific and technical overview of the GLAST development. IDS will be appointed at the time of selection under this AO and will serve for a period of 30 months after post launch checkout.

5.4 Science Working Group (SWG)

The IPI's, the IDS's, 3 designated co-investigators for the Large Area Telescope, the Project Scientist, and the NASA Headquarters Program Scientist (ex officio) will constitute the GLAST Science Working Group (SWG). The SWG will be chaired by the Project Scientist. The chairman will serve as the Group's representative in activities not requiring participation by all group members.

The SWG will:

1. Assist the GLAST Project in establishing overall requirements and priorities in support of the mission plan
2. Assist the GLAST Project in maintaining, updating and prioritizing the science requirements
3. Assist the GLAST Project in the definition and development of the calibration, data handling, data reduction, and mission operations systems
4. Participate in GLAST Project reviews and meetings to coordinate scientific requirements and to assist the GLAST Project in mission decisions as they relate to scientific objectives

APPENDIX E

EDUCATION AND PUBLIC OUTREACH

EDUCATION AND PUBLIC OUTREACH PLAN EVALUATION CRITERIA

There are two classes of evaluation criteria against which proposed OSS E/PO activities will be evaluated. The general criteria to be applied to the evaluation of all proposals, which reflect requirements necessary for further consideration of a proposal, are:

- The quality, scope, and realism of the proposed E/PO program including the adequacy , appropriateness, and realism of the proposed budget;
- The capability and commitment of the proposer and the proposer's team and the direct involvement of one or more science team members in overseeing and carrying out the proposed E/PO program;
- The establishment or continuation of effective partnerships with institutions and/or personnel in the fields of education and/or public outreach as the basis for and an integral element of the proposed E/PO program;
- The adequacy of plans for evaluating the effectiveness and impact of the proposed education/outreach activity.

To ensure that the goals and objectives of the OSS E/PO strategy are realized in practice, proposals will also be evaluated using the following specific criteria. Based on the funding guidelines given in Section 4.3, the E/PO elements of proposals submitted in response to this AO may involve the expenditure of substantial resources. Therefore, it is expected that proposed programs will have a breadth and depth commensurate with these resources. Such programs are expected to be multi-faceted in nature, address a number of different aspects of education and outreach contained in the specific criteria, and have state, regional or national scope. The specific criteria are:

- For proposals dealing directly with or strongly affecting the formal education system (e.g., through teacher workshops or student programs carried out at informal education institutions such as science museums and planetariums), the degree to which the proposed E/PO effort is aligned with and linked to nationally recognized and endorsed education reform efforts and/or reform efforts at the state or local levels;
- The degree to which the proposed E/PO effort contributes to the training of, involvement in, and broad understanding of science and technology by underserved and/or underutilized groups;
- The potential for the proposed E/PO activity to expand its scope by having an impact beyond the direct beneficiaries, reaching large audiences, being suitable for replication or broad dissemination, or drawing on resources beyond those directly requested in the proposal.

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Although creativity and innovation are certainly encouraged, note that neither of these sets of criteria focuses on the originality of the proposed effort. Instead, NASA seeks assurance that the proposer is personally committed to the E/PO effort and the PI and/or appropriate research team members will actively be involved in carrying out a meaningful, effective, credible, and appropriate E/PO activity; that such an activity has been planned and will be executed; and that the proposed investment of resources will make a significant contribution toward meeting OSS E/PO plans and objectives.

ASSISTANCE FOR THE PREPARATION OF EDUCATION AND PUBLIC OUTREACH PROPOSALS

NASA OSS has established a nation-wide infrastructure of space science education/outreach groups whose purpose is to directly aid space science investigators in identifying and developing high quality E/PO opportunities. This infrastructure provides the coordination, background, and linkages for fostering partnerships between the space science and E/PO communities, and the services needed to establish and maintain a vital national, coordinated, long-term OSS E/PO program. Of particular interest to proposers to this AO are two elements of this system (which are also described in more detail in the OSS education/outreach implementation plan referred to above):

- Four OSS science theme-oriented E/PO "Forums" to help orchestrate and organize in a comprehensive way the education/outreach aspects of OSS space science missions and research programs, and provide both the space science and education communities with ready access to relevant E/PO programs and products; and
- Five regional E/PO "Broker/Facilitators" to search out and establish high leverage opportunities, arrange alliances between educators and OSS-supported scientists, and help scientists turn results from space science missions and programs into educationally-appropriate activities suitable for regional and/or national dissemination

Prospective proposers are strongly encouraged to make use of these groups to help identify suitable E/PO opportunities and arrange appropriate alliances. Proposers should be careful to note that these Forums and Broker/Facilitators have been established to provide help, but the responsibility for actually developing the E/PO program and writing the proposal is that of the proposer. Points of contact and addresses for all of these E/PO Forums and Broker/Facilitators may be found by opening "Education and Public Outreach" from the menu of the OSS homepage at <http://spacescience.nasa.gov/>.

APPENDIX F

REGULATIONS GOVERNING THE PROCUREMENT OF FOREIGN GOODS OR SERVICES

The following Federal Acquisition Regulation (FAR) clauses cover the purchase of foreign goods and services and may be included in contracts resulting from this Announcement of Opportunity:

52.225-3 Buy American Act -- Supplies (January 1994)

52.225-7 Balance of Payments Program (April 1984)

52.225-9 Buy American Act -- Trade Agreements -- Balance of Payments Program (January 1994)

52.225-10 Duty-Free Entry (April 1984)

52.225-11 Restrictions on Certain Foreign Purchases (May 1992)

52.225-17 Buy American Act -- Supplies Under European Community Agreement (May 1995)

52.225-18 European Community Sanction for End Products (May 1995)

52.225-19 European Community Sanction for Services (May 1995)

52.225-21 Buy American Act -- North American Free Trade Agreement Implementation Act -- Balance of Payments Program (January 1994)

The proposer is directed to the Federal Acquisition Regulation and the NASA FAR Supplement for further information on these regulations. Access information for these documents is given in the GLAST Bibliography (see Appendix C).

APPENDIX G

CERTIFICATIONS